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DECEMBER

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Merry Christmas

and

World Peace

in

1944

The Staff
of
Telephone Engineer

TELEPHONE ENGINEER AND MANAGEMENT

Vol. 47. No. 12 DECEMBER, 1943

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Highlights of the Communications News

Important Communications developments of the past month, briefed for busy readers

by
ROLAND C. DAVIES
Editor, Telecommunications Reports

Government

THE wheels of the governmental mill in the national capital were still grinding away on many issues of interest to the telephone industry during mid-December with little, if any, prospect of a let-up for the Christmas holiday season.

The plan for a merger of the American international communications systems which is due to come before the Senate Interstate Commerce Committee for hearings early next year, has produced some highly significant turns. FCC Chairman James Lawrence Fly is definitely trying to "grab the ball" and made an address during the latter part of November in which he outlined his blueprint for postwar world communications. The Commission chieftain, it is felt, is endeavoring to become the Number One communications authority in the Federal Government and is aiming, it is believed, his shots at being named the Communications Advisor to the President at coming peace conference.

The FCC majority, who in this field are closely following Mr. Fly's leadership has indicated to the Senate Committee that in international communications a single company, combining cable and radiotelegraph and radiotelephone, would be the best medium. This viewpoint, was conveyed to the Senate body in the testimony of FCC Commissioner Ray C. Wakefield on the White-Wheeler Bill—the measure sponsored by the broadcasting industry to revamp the FCC into two divisions and to revise its regulatory powers over broadcasting. Commissioner Wakefield stressed that the FCC felt it would be better to have a single entity in international communications than two or more companies. He injected the subject of international communications into the White-Wheeler Bill picture when the members of the Senate Committee questioned him about the complaints of Press Wireless that it had been "frozen" out of the war zones by FCC action which injured its function of handling the dispatches of American correspondents by radio-communications.

Developments

OTHER developments of interest to the telephone industry during early December were the appeal of the Independents to the Senate Finance Committee to reject the increase in the excise tax on local telephone service and for distinct treatment of utilities in regard to the excess profits tax; and the presentation of the Independent industry before the Wage-Hour Division on the proposal to make the 40 cent per hour minimum wage effective immediately instead of being imposed in 1945 as the Fair Labor Standards Act prescribes. (Detailed summaries of these presentations follow later in this column).

Even though the hearings on the White-Wheeler Bill have been primarily and almost exclusively keyed to the broadcasting industry, the sessions in early December contained several developments touching on the telephone industry. Commissioner Wakefield brought out that the broadcasting industry showed it was still in its "adolescent years" in opposing the FCC's regulation and contrasted it with the telephone service in the United States, "the best in the world" wih the comment that it has not been contended seriously in recent years "that because of that excellence the telephone industry should not be regulated.' He told the Senate Committee that as far as the proposal for divisions the Commission operated along that line in recent years and it would be unwise to write into the law a provision to make the Chairman the sole spokesman for the FCC as Commissioners handling telephone matters should have authority to talk to officials of the industry.

FCC

IN bringing out that the larger interests in broadcasting had been creating and manufacturing fear of the FCC authority, Commissioner Wakefield drew an analogy from the telephone field by citing that for years and until quite recently the Independent telephone industry feared the Commission and stayed away from it. "There are many situations such as divisions of revenue, operating practices and other points," Mr. Wakefield stated, "where the interest of the Inpendents meet those of the American Telephone company where the Commission can be useful in resolving differences in fairness to both. There are elements of the Independent industry today which have come to realize that the Commission can be and, in some instances, is one of its best friends. Many of the people in this industry are coming to the Commission voluntarily with their problems. This is as it should be."

Post-War

THE predictions of a number of leading radio engineers before the Senate Committee also were of interest to the telephone industry. However, the most eminent radio engineer who testified before the Senate Committee —Dr. Edwin H. Armstrong, the inventor of Frequency Modulation, would not forecast as did some of the other technical witnesses that FM radio would replace telephone wires in the future. He told Senate Committee Chairman Wheeler that he could not let his imagination go so far along with such a prediction.

Several other radio engineers foresaw the radio marvels after the war with tremendous changes in communications. FCC Commissioner T.A.M. Craven, its former Chief Engineer and prior to that a leading radio consulting engineer, viewed radio as replacing wires for long distance traffic in many isolated parts of the country and also predicted that the day will come when every telephone will have its television attachment and telegrams will be sent by "letter page" over the radio. Associated Director A. Earl Cullem of the Harvard University Radio Research Laboratory and a former broadcasting construction engineer, forecast nation-wide television relays which he said could carry 1,000 telephone calls simultaneously. Another leading radio engineer, C. M. Jansky, Jr., a pioneer in FM, foresaw that multiplex teletypewriter or facsimile service could be superimposed on the frequency used by an FM broadcasting station.

Tax Relief

A strong appeal that Congress in the new Tax Bill will not place telephone service in the category of "luxuries" with increases in the present excises, especially for local telephone users, and will alleviate the inequitable incidence of the proposed increased excess profits taxes on telephone companies and other public utilities by special treatment because of being under regulation with frozen rates was made to the Senate Finance Committee Dec 3 by President Harold V. Bozell of the General Telephone Corporation and Chairman of the U. S. Independent Telephone Association's Tax Committee.

Upon the conclusion of his statement, Senator David I. Walsh (D. Mass.), Acting Chairman of the Finance Committee due to the illness of Senator George of Georgia, told Mr. Bozell that the Senate Committee will give full consideration to the proposals of the U. S. Independent Telephone Association. On the question of special treatment for utilities in regard to excess profits taxes, Mr. Bozell's position was supported by a trio of officials from the electric power and gas utility industry from Southern California who also gave statements before the Senate Committee.

In asking that the Senate Committee consider the impact of the increased excise taxes upon long distance and local telephone service users, Mr. Bozell emphasized that his views were largely a reflection of "our customers' comments" who will pay these levies. In the case of the long distance tax which is proposed to be increased from 20 to 25%, the General Telephone President pointed out that the boost will be comparatively unproductive in many cases such as war contractors who will be reimbursed, and for business concerns who can deduct it as a business expense, and will be overburdensome upon the service men and women who make up, in their long distance calls to their homes and friends, a very large part of the present toll traffic. A 25% tax on the calls of the service men and women is a very heavy charge, he stressed, and he asked the Senate Committee to weigh these facts on this boost in the long distance excise as well as the gap between it and the 15% levy on transportation of persons. In reply to a question of Senator Walsh, Mr. Bozell felt that the Treasury's estimate of a gross added yield of $48,000,000 from this increased tax was inaccurate because of the reimbursements to war contractors and business firms' deduction of these excise payments from their own tax returns.

Convention Dates

Minnesota Telephone Association, Radisson Hotel, Minneapolis, January 25, 26, and 27.

Texas Telephone Association, Baker Hotel, Dallas, March 13 and 14.

Iowa Independent Telephone Association, Hotel Fort Des Moines, Des Moines, April 10 and 11.

Nebraska Telephone Association, Hotel Fontennelle, Omaha, April 13 and 14.

Illinois Telephone Association, Edgewater Beach Hotel, Chicago, April 18 and 19.

Spring Executive Conference, United States Independent Telephone Association, Edgewater Beach Hotel, Chicago, April 20 and 21.

Ohio Independent Telephone Association, Deshler-Wallick Hotel, Columbus, April 25 and 26.

Indiana Telephone Association, Serverin Hotel, Indianapolis, May 3 and 4.

Pennsylvania Independent Telephone Association, Berkshire Hotel, Reading, May 18 and 19.

New York State Telephone Association, Hotel Syracuse, Syracuse, May 24 and 25.

Mr. Bozell stated that "we feel very strongly it is a mistake to increase" the tax on local telephone service by fifty per cent—from 10% to 15%. He emphasized to the Senate Committee that the local telephone service was in no sense a luxury but was essential to the social and business life of a community and cited how the House Committee in its report on the tax had depicted its excises as falling upon luxuries.

Widespread Reaction From Public Against Increases

"There has been a widespread reaction from the public from all over the United States," against this increase in the local telephone tax, Mr. Bozell told the Senate Committee. He related that the more the House Ways and Means Committee had studied it the greater was its concern and how the House Committee, in fact, had only retained the increase to 15% by a 10-10 tie vote during its last day's consideration of the measure.

After pointing out that the Independent industry with its 6,350 companies serve 12,000 communities—almost twice as many as the Bell System—and operate 4,837,000 of the nation's 24,850,000 telephones as of the end of 1942, Mr. Bozell informed the Senate body that 80% of the telephones served by the Independents and Bell System are residential and in the case of the Independents especially one-quarter of the 80% proportion are rural or farm telephones.

Would Terminate Tax At End of War

"WE BELIEVE an increase in this tax from 10% to 15% is entirely out of order," Mr. Bozell drove home to the Senate Committee. "The local telephone service is a part of the every-day operation of the community, necessary to the social and business life of today. A tax on local telephone service is simply a form of selective sales tax. Compared with transportation, this service is much akin to streetcar and bus service and to commutation service on railroads which are properly not taxed at all! He added that it would be more equitable to seek additional selected luxury items rather than increase the excises on telephone service "because collection is mechanically easy for the Treasury." In a memorandum to the Committee Mr. Bozell pointed out that the cost of collecting these excise taxes, together with the time consumed in explaining them to subscribers, is growing more onerous and the Bell System had estimated it had to bear a cost of 5% of the total tax collections in the accounting and billing and collecting. The memorandum also brought out how much more difficult was the computation of 15% instead of 10% for local bills and 25% in place of 20% (the present rate) for long distance tolls.

Mr. Bozell asked the Senate Committee to revise the House bill's language which would terminate the proposed increases six months after the end of hostilities so as to discontinue the entire telephone excises, all of which are "war taxes", at the end of the war.

Different Treatment of Telephone Companies on Excess Profit Tax

IN connection with the excess profits tax, not only the increase from 90% to 95% but the formulae for computation under the invested capital method, Mr. Bozell tried to impress upon the Senate Committee the need for different treatment for the telephone industry and other public utilities. He told the Senate body that "regulated public utilities have for many sound

business reasons generally continued to distribute to shareholders all but a reasonable portion of their earnings." It appears unfair, he added, to penalize the many corporations who have not permitted earnings to accumulate merely to reach through this change in the credit percentages those corporations who have, under the present provisions of the Internal Revenue Code relating to the computation of invested capital, benefited by this process. He was assailing the provision in Section 205 of the recently House-approved tax bill providing for a decrease in the excess profits credit under the invested capital method of from 8, 7, 6 and 5% to 8, 6, 5, and 4% which was aimed primarily to offset increases in the invested capital credit obtained by retaining in the business earnings which have not been distributed. Mr. Bozell related that the telephone industry had rather consistently plowed back earnings into the business so as to improve plant and service. The telephone industry, he cited, has a record of average small stockholdings (in General Telephone the average holding is less than $2,000) and these holders will be the most penalized by this decrease in credit on invested capital.

Public utilities in the main have no true excess profits, Mr. Bozell stated, because they are regulated and subjected to a fair rate of return by the commissions. Thus the increase in the excess profits tax rate and decrease in the invested capital credit would accentuate the inequitable incidence of these taxes on the telephone companies. Mr. Bozell gave to the Senate Committee proposed amendments to give different treatment to telephone companies and utilities and a study which the California Railroad Commission through its Public Utilities Director E. F. McNaughton and Research Engineer Loren East had made showing the harmful effects of the 1942 Revenue Act's excess profits tax provisions upon public utilities. Mr. Bozell also pointed out that this subject had been discussed at the 1943 Chicago convention of the National Association of Railroad and Public Utilities Commissioners and was a matter of considerable concern to Wisconsin Chairman Peterson and other leading state commissioners. Some state commissions feel that the excess profits tax provisions now virtually nullify rate regulation, he noted.

Mr. Bozell proposed that the tax law be revised so as to provide the rate of return on invested capital be allowed as a rate of return on current invested capital in computing the income subject to the excess profits tax with the total net income subject only to the present higher normal tax and surtax.

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This year our needs are doubly great—because a wartime rise in tuberculosis must be prevented. So, make sure that every letter and package carried by Santa is stamped with your Christmas gift to mankind—and please send in your contribution today!
BUY CHRISTMAS SEALS
The National, State and Local Tuberculosis Associations of the United States

Taxes Must Be Equitable

IT WAS emphasized to the Senate Committee by the USITA Tax Committee Chairman that public utility companies, including telephone companies, have had their earnings regulated for years and been allowed to earn only a reasonable rate of return sufficient to maintain a sound business, financial and credit structure and this rate of return is computed after allowance for taxes, including Federal Income Taxes. Many companies do not earn an amount equal to a fair rate of return, he pointed out, but he stressed that public utilities are not able due to regulation to recover through income losses which result in periods of extremely high taxation like other industries. Any utility which earns more than its fair rate of return has its rates to the public reduced by the commission, he added.

"It is not the purpose of the utilities to seek an arbitrary reduction of their tax burden," Mr. Bozell stated. "They desire to and are willing to carry their fair share of the expense of prosecuting the war and financing the government. It is inevitable that during times like these we must pay greater taxes and have less income available to shareholders and investors in the business. We expect to pay greater normal and surtaxes and are willing to pay fair excess profits taxes but we do believe that excess profits should be fairly computed and only true excess profits be subject to tax."

Urging Congress to consider this problem from the standpoint of preventing injury to the regulated utility companies so they can continue to render their services without having their credit and financial position severely injured in such a way as to harm their operations after the war, Mr. Bozell pointed out that the utility industry requires many times the average investment per employee required in other industries and also is required to grow to provide services as de-

(Please turn to page 39)

Fred P. Auxer

ON THANKSGIVING morning, November 25th, 1943, there passed from this life, Fred P. Auxer, 67, founder and president of The National Telephone Supply Company of Cleveland, Ohio.

Ever since Mr. Auxer founded his company 42 years ago he has been well known in the Communication and Electric Light and Power Fields.

In Mr. Auxer's death the telephony industry has lost one of its most outstanding men in the manufacturing field. He has been one of Cleveland's most prominent citizens, though in a very quiet way, for he was never ostentatious. In fact, Fred, as he was lovingly known to a very large group of friends, was quiet and unassuming.

Before organizing The National Telephone Supply Company, Mr. Auxer was employed by McIntosh-Hunting Co. He started his own company in 1901 and has continuously operated from that time on in the production of products for communication and power companies. From the very inception of the business, Fred Auxer insisted that anything produced by his company should be an honest product, honestly merchandised. Honesty and sincerity were two of the fundamental principles on which his business and social life were based.

He was a member of the Cleveland Athletic Club, the Cleveland Rotary Club, the Jesters, the Sojourners Club, the Advertising Club, and the City Club, and belonged to the National Manufacturers Association. He was a thirty-second degree Mason. Surviving are his wife, Mrs. Elizabeth Auxer, a daughter, Mrs. Alice Watkins; two grandchildren, and a sister, Mrs. Mabel Minor.

Harry E. Eldridge

Harry E. Eldridge, retired telephone company executive, died December 4 at his home at 815 Foxdale Avenue in Winnetka. Mr. Eldridge would have celebrated his 57th birthday on December 13. He retired from the Illinois Bell Telephone Company in 1940, after 33 years of service, because of poor health.

Born in Wolcott, Indiana, in 1886, Mr. Eldridge began his telephone career in 1907 as a service inspector in the telephone company's suburban traffic department. By dint of hard work and the development of his natural ability, he rose, step by step, to positions of greater responsibility and trust with the company. For the 16 years before his retirement he held the important post of division commercial manager of the Illinois Bell's suburban division.

Mr. Eldridge was well known in the communications field as an executive who

Harry E. Eldridge

was intensely and enthusiastically interested in the "human side" of the telephone business. A number of his aricles on such subjects as "public relations," "morale" and "keeping up interest in the work" were published from time to time in trade papers. Mr. Eldridge was also well known for the talks he gave on the same subjects before various business men's organizations.

For many years he had been a member of the Executive's Club of Chicago. He was also a member of the Telephone Pioneers of America.

Mr. Eldridge is survived by his wife, Helen Sullivan Eldridge, and by two daughters, Mrs. Thomas V. Johnson of San Francisco, and Marylin Clara, who is now attending the University of Illinois. Also surviving are four sisters and three brothers: Mrs. C. C. Warner, Mrs. Roy France, Hazel, Alice C., Frank L., Neal B., and Merritt F. Eldridge.

Mr. Eldridge's brother, Frank L., is one of the best known sales representative in the Independent telephone industry having devoted many years in close association with our industry.

FCC to Regulate Hotel Surcharges

Affirming its jurisdiction in matter of special surcharges collected by hotels, clubs, and apartment houses in the District of Columbia on interstate and foreign telephone calls originating on their premises, FCC adopted an order concluding it also has jurisdiction to inquire into, determine and regulate, and to prohibit such surcharges if they are found to be discriminatory or unlawful.

In a concurring opinion, D. C. Public Utilities Commission held that such surcharges for local telephone service are under its jurisdiction. While FCC left for future determination whether or not such surcharges will be permitted, it ordered the respondents, the AT&T and Chesapeake & Potomac Telephone Company, to file tariff schedules showing all such surcharges by January 15, 1944, to be effective February 15, next. The FCC refrained from deciding question of whether interzone rates were subject to its jurisdiction.

File for Commission Approval On Acquisition of Keystone

The Bell Telephone Co. of Pennsylvania and the Keystone Telephone Co. filed a joint application Nov. 24 with the Pennsylvania Public Utilities Commission seeking the approval of the Bell Co.'s acquisition of the Independent company's physical properties. The Keystone Telephone Co. is serving 46,200 telephones in Philadelphia and its environs.

Marking the clumination of competitive telephone service within a city in the United States, the Bell of Pa. in its acquisition of Keystone, which had been approved by the FCC early this year, is proposing to buy the Keystone properties for $13,431,454. The Bell Company is going to assume the $10,910,000 outstanding Keystone bonds and will pay the balance of the purchase price in cash. The Bell of Pa. is taking over the Keystone employees and will bring them under the Bell System Pension Plan—a step which was held up as a model during the telegraph merger case. The Bell company will apply upon unification of the Keystone services its own existing traffic and rates.

Although approval by the Pennsylvania commission is deemed a certainty, the regulatory body in accordance with its rules took the application for the Keystone acquisition under advisement and will hold it in abeyance for 30 days so complaints against the consolidation can be registered. Then after the first of the year the commission will hold hearings on the plan.

Telephone Company Tree Trimming Practice

By J. S. REED, JR.
Lincoln Tel. & Tel. Co.
Lincoln, Nebr.

Fig. 2—Upright form of American Elm Note use of cable blocks to protect cable from abrasion. (Courtesy of Forestry Dept., Consumers Power Co., Jackson, Mich.)

General

ONE of the chief causes of trouble in outside plant is **tree interference** to open wire and cable leads. Transmission and signaling difficulties are often traced to the contact of tree foliage with bare line wires, resulting in leakage of voice and ringing currents through the foliage. This form of trouble is aggravated by wet weather which increases the electrical conductivity of the foliage and in addition stimulates further growth of the interfering branches.

Tree interference on a cable lead is manifested by the crystallization of the cable sheath resulting from the vibration of the cable caused by contact of tree branches with the cable or the messenger strand supporting the cable. Such a condition invariably makes necessary extensive and costly repairs or replacements to rectify the damage to the cable sheath.

The obvious remedy for tree interference is to remove the offending branches and prune the trees in such a manner that tree contact with line wires or cable will not occur for some time at least. This process is familiarly known as **tree trimming.**

The art of tree trimming requires more skill than is generally appreciated. Large power companies, to whom inadequate tree clearance is a very serious problem, often hire professional tree trimming experts or maintain a trained crew of their own, headed by a forester, that spends the entire time in maintaining line clearances. The average telephone company generally has little need for such elaborate tree trimming programs, in spite of the fact that tree trimming costs represent about 70 percent of exchange maintenance expenses. However, an understanding of certain fundamentals of forestry applied to tree trimming operations is necessary if public goodwill is not to be endangered by disfiguring trees on right of ways as the result of wrong pruning methods.

This article discusses the effect of pruning on the welfare of trees, steps in obtaining permission to trim trees, the effect of tree characteristics on line clearances, correct trimming practices, and tools used in this work.

.....19....

To The Alpha Telephone & Telegraph Company:

The undersigned being owner of real estate in the County of.....in the State of....., and of certain trees growing thereon, which have grown to interfere with the wires of the Alpha Telephone & Telegraph Company,, which interference will increase if the said trees are not trimmed, permission is hereby granted to the Alpha Telephone & Telegraph Company to trim the said trees and keep the same trimmed so that the branches shall be clear of the wires at least eighteen inches, provided the same shall be done without expense to me. The property is described as follows:

.....

.....

.....

Figure 1 — Form Used for Obtaining Written Permission from Property Owners to Trim Trees.

Welfare of Trees as Influenced By Tree Trimming Operations

IN recent years there has been a growing public appreciation of the natural beauty of roadside plant growth. This has resulted in a demand

Fig. 3 — Spreading form of White Oak. (Courtesy of Forestry Dept., Consumers Power Co., Jackson, Mich.)

for the preservation of trees and shrubs growing along right of ways. State highway departments under laws passed by legislatures now supervise the planting of trees and shrubbery and the care of natural plant growth bordering on State and Federal highways. These authorities are interested in seeing that the natural appearance of trees and hedge or coppice growth is disturbed as little as possible. The result is that telephone companies are confronted with the necessity of restricting their tree trimming work along State and Federal highways to an absolute minimum demanded by the highway department.

Although the utilitiy companies naturally desire to do away with the nuisance and expense of trimming trees along pole leads, they cannot escape the necessity for preventing tree growths from interfering with their lines. The State agencies are fully aware of this fact and are willing to permit certain necessary trimming that cannot be otherwise avoided, provided the companies request permission in advance of the work.

Obtaining Permission to Trim Trees

PERMISSION to trim trees along State and Federal highways is required by State Highway Departments. In the case of trees along city or town thoroughfares it is often necessary to obtain permission from municipal authorities, usually verbal, before proceeding with the trimming work. Work along county or section roads seldom, if ever, require prior consent from the authority in charge.

In many states it is possible to obtain a blanket permit to trim trees within a certain area. This takes the form of a permit prepared on a standard form or as a letter of authority detailing the work to be done and listing the highways included in the area covered. A field representative of the highway department usually accompanies the telephone company field man or manager in charge of an inspection trip throughout the area and discusses the details of the proposed work with him, after which the permit is issued. The department representative may or may not be on hand during the actual tree clearance operations.

It should be noted here that tree pruning may not be the only kind of work done under the state permit. Certain trees may have to be removed entirely or excessive hedge or coppice growths thinned out or cut back. Such work must not be performed unless specifically permitted by the responsibile agency.

In addition to securing permission from the responsible authority, it is necessary to obtain consent from the owner of the property abutting the right of way to trim trees thereon. Prior consent of the owner is absolutely essential even if a state permit is not required for trimming operations along country roads. Although such authorization may be verbally given by the owner, it is always wise to have a written permit for him to prevent possible later misunderstandings.

It is important that the owner himself and not a tenant on his land gives the permission. In case of doubt, county records should always be consulted. The writer knows of a case in which the foreman of a tree trimming crew obtained consent to prune trees on the right of way from a tenant understood to be the owner of the property abutting the right of way. When the legal owner discovered this fact he threatened to sue the company involved for damages. This company had no other course than to settle the claim out of court, resulting in the loss of a large portion of its revenue for the year from the exchange in which the incident occurred.

Figure 1 illustrates an example of a form used in securing the written consent of a property owner to trim

(Please turn to page 49)

Fig. 4—Effective tree clearance obtained by proper topping of sugar maples. (Courtesy of Forestry Dept., Consumers Power Co., Jackson, Mich.)

Telephone Engineer's TRAINING COURSE

ELECTRICAL FUNDAMENTALS FOR THE TELEPHONE MAN

Alternating Current Theory
Part VII---B

Resonant Frequency of Coils and Condensers

IT is found that every inductance and capacity has some resonance frequency, that is, some frequency at which the two effects completely cancel each other. (See Fig. 17.) The resonance frequency of an inductance and condenser in series can be computed from the simple formula:

$$f = \frac{1}{6.28\ \sqrt{LC}}$$

Where: f = resonant frequency
L = inductance in henries
C = capacity in farads.

It is this series resonance effect that is made use of in the tuning of radio sets. If a capacity and inductance are placed in parallel rather than in series there is also a resonant effect

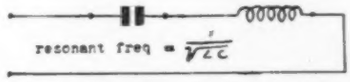


Fig. 17. Series resonant circuit

which is referred to as **parallel resonance.** At some frequency (resonance frequency) at which the two effects are exactly equal to each other, **the combination offers a maximum impedance** of almost infinite value to alternating currents of the resonance frequency (see Fig. 18). This type of

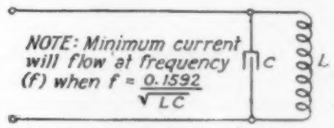


Fig. 18. Parallel resonant circuit

resonance is made use of in radio circuits where it is desired to reject an alternating current of some given frequency. Figure 19 illustrates how in a simple radio circuit, the combination of series and parallel resonance is made use of in the tuning so as to receive certain stations and to reject other stations.

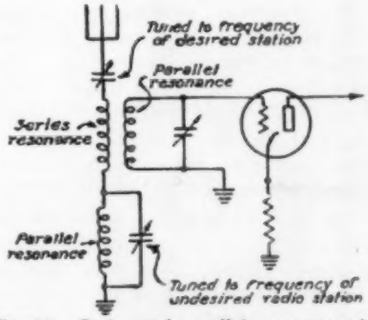


Fig. 19. Series and parallel resonant principles as used in a radio circuit

Alternating Current Impedance

THE total retaring effect which resistance and reactance offer to the flow of alternating current is expressed in ohms and is referred to as **impedance.** Impedance is symbolically represented by the letter Z. To illustrate what is meant by impedance, assume we have a circuit consisting of a coil whose resistance is 100 ohms and whose reactance is 200 ohms which we wish to use on a 60 cycle circuit (see Figure 20.) What impedance does this coil offer to the flow of 60 cycle alternating current?

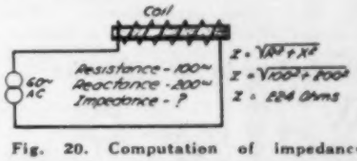


Fig. 20. Computation of impedance

Inasmuch as the impedance offered by resistance and that offered by reactance **act at right angles with respect to each other,** it is necessary to add them geometrically rather than arithmetically in order to get their true impeding effect in a circuit. This is done by the simple formula:

$$Z = \sqrt{R^2 + X^2}$$

Where: R = effective resistance in

ohms.

X = inductive resistance in ohms.

Z = impedance in ohms.

For the circuit this would be:

$$Z = \sqrt{100^2 + 200^2} = 224 \text{ ohms}$$

The simple formula is solved by first squaring the resistance, then the reactance, and adding the two results together, then extracting the square root of this addition.

In other words the coil whose resistance was 100 ohms and whose reactance was 200 ohms would limit the current about the same amount as a 224 ohm resistor.

L, C, and R in Same Circuit

IN a circuit consisting of inductance, resistance, and capacitance all in series the total impedance is obtained in the same manner as just described except that it is necessary to subtract the inductance reactance from the capacity reactance before squaring them.

Computation of the impedance of coils and condensers connected in parallel or series is much more complicated than is the computation of resistance. Space does not permit review of this subject here. If the items connected consist of resistance only, then they may be added together the same as in a direct current circuit.

It should be noted that the resistance used in the impedance formula is effective resistance and not simple ohmic resistance. Figure 20 - 1 explains the difference.

Figure 21 illustrates by a simple example how the impedance of a series circuit which contains inductance, capacity, and resistance would be computed.

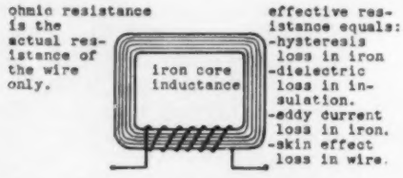

ohmic resistance is the actual resistance of the wire only.
iron core inductance
effective resistance equals:
-hysteresis loss in iron
-dielectric loss in insulation.
-eddy current loss in iron.
-skin effect loss in wire.

Fig. 20-1. Illustration showing difference between effective and ohmic resistance

Ohm's Law in A.C. Circuits

WE have previously explained that one of the basic laws of electrical circuits is that known as **Ohm's** law is applied to direct current circuits is also equally true for the alternating current circuits. However, greater care must be exercised in computations involving alternating current circuits, since relationships such as Ohm's law hold true only when the various components of voltage, current, and resistance are "in phase" with each other.

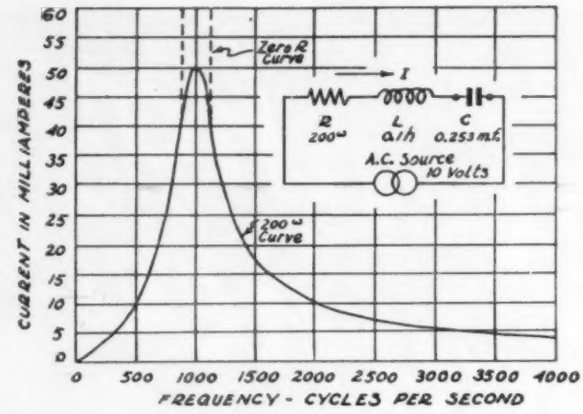
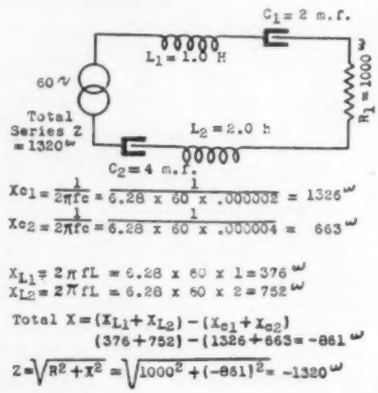


Fig. 19-1. Curve showing variation of current with frequency in an actual series resonant circuit

It should be noted that in a series resonant circuit maximum current will flow through the circuit at resonance, while in a parallel resonant circuit minimum current will flow when the circuit is resonant.

The formula for computing parallel resonance is much more complicated than the series resonance formula, however, for rough work the simple series formula is sufficiently accurate for use with parallel circuits. The relationship between frequency and current in a serious resonant circuit is shown graphically in Figure 19 - 1.



$$Xc_1 = \frac{1}{2\pi fc} = \frac{1}{6.28 \times 60 \times .000002} = 1326^{\omega}$$

$$Xc_2 = \frac{1}{2\pi fc} = \frac{1}{6.28 \times 60 \times .000004} = 663^{\omega}$$

$$X_{L1} = 2\pi fL = 6.28 \times 60 \times 1 = 376^{\omega}$$

$$X_{L2} = 2\pi fL = 6.28 \times 60 \times 2 = 752^{\omega}$$

$$\text{Total } X = (X_{L1} + X_{L2}) - (X_{c1} + X_{c2})$$

$$(376 + 752) - (1326 + 663 = -881^{\omega}$$

$$Z = \sqrt{R^2 + X^2} = \sqrt{1000^2 + (-881)^2} = -1320^{\omega}$$

Fig. 21. Computation of impedance in series circuit containing both capacity, inductance and resistance

In speaking of anything being in phase we mean **working in conjunction with or in the same direction.** As an analogous illustration, if two men were pushing on some object, both in the same direction, we would say that the efforts of these two men were **in phase.** However, if one man were pushing east and the other man north on a given object, we would say that their efforts were 90° out-of-phase. If one man were pushing east and the other west we would say that their efforts were 180° **out-of-phase** and if each were pushing with equal intensity, their efforts would entirely cancel.

Leading and Lagging Currents

ALTERNATING current, in flowing through a capacity, is said to "lead the voltage" by 90° and in flowing through an inductance is said to "lag the voltage" by 90°. In other words, the current is out of phase with the voltage in both instances. The practical significance or conception of this to the beginning student should be that a current which flows in a circuit as a result of the impressed voltage does not always follow and keep pace with the impressed voltage. In other words, when the voltage has reached its maximum value in the cycle, the current, it would seem, should also have reached its maximum value. However, as stated, if a capacity or inductance is present in a circuit, the current may be either 90° ahead or behind this maximum value.

The graphic method of showing current and voltage out of phase is illustrated by Figure 22.

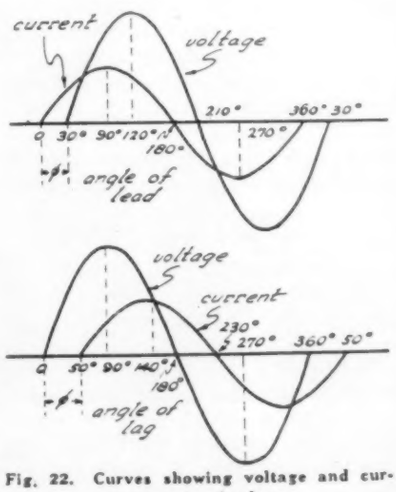


Fig. 22. Curves showing voltage and current out of phase

Reason for Leading or Lagging Currents

In other words, the current may be zero at the instant the voltage is maximum. **The physical reason that current can exist in a circuit when there is no voltage present is that energy is stored up on a portion of the cycle when voltage is present, and then when the voltage has dropped to zero, the inductance or capacity releases its energy and current therefore flows, even though the volatge may be zero.**

Inductance and capacity are somewhat analogous to the inertia of a large flywheel which, even though the propelling force might cease, would continue to run for some time due to its inertia. Figure 23 shows how current and voltage are shown graphically when in phase.

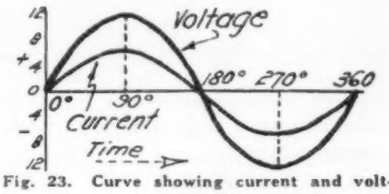


Fig. 23. Curve showing current and voltage in phase

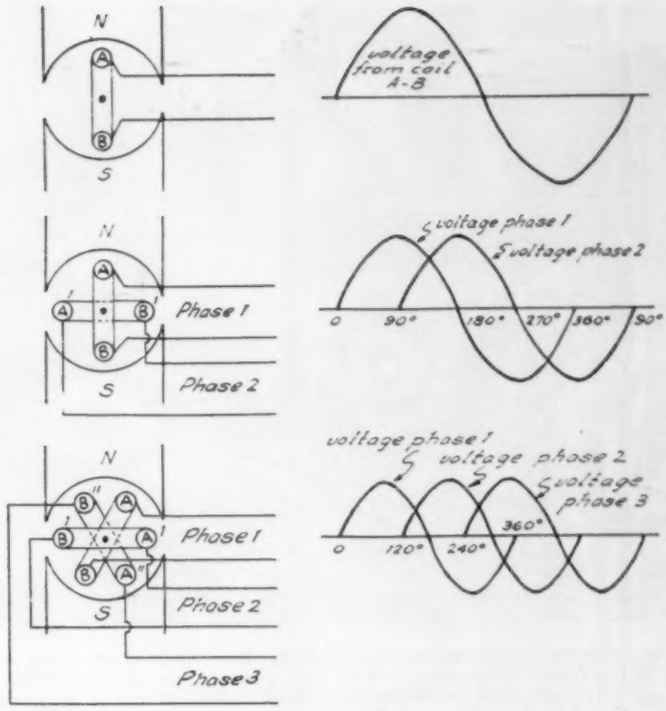


Fig. 24-1. Relationship between windings in single, two, and three phase generators

Single Phase and Three Phase Alternating Current

IN commercial light and power work, we have two types of circuits. One referred to as **single phase circuits,** and the other as **three phase circuits.** Single phase power can be furnished over a single pair of wires, while three phase generator furnishing single phase essential difference between single phase and three phase power can best be understood by thinking of a single phase generator furnishing single phate power and three single phase generators connected so as to form a three phase power circuit. In one case, we have only one set of conditions occurring at any instant, while in the three phase power circuit we have three separate and different sets of conditions occurring simultaneously.

Figure 24 - 1 shows the relationship between the windings of a single, two, and three phase generator.

120° Relationship in a Three Phase Circuit

THE phase relationship between the voltage across any two of the three wires of a three phase power circuit differs from that across any other two wires at any instant by 120°. This is shown in Figure 24.

Three phase power can produce a **rotating magnetic field** in a series of electro-magnets arranged in the form of a circle, as, for example, the stator of a motor. It is this feature of the three phase power which makes it particularly suitable for heavy motor use as it results in a motor which is very efficient compared to the single phase type which obtains its rotating field in a different manner. All large motors are of the three phase type.

Three phase power is not generated by three separate single phase generators but rather by a single three phase generator having windings located 120° apart on the generator stator.

Note.—The terms "stator" and "rotor" as used in AC work refers to the stationary and rotating members of generators and motors.

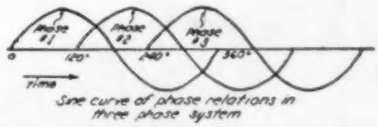


Fig. 24. Phase relationship in three phase circuit

Star and Delta Connections

IN dealing with three phase circuits we have two methods of connecting windings of transformers or generators, one known as the **star or Y method,** and the other as the **delta method.** These are shown schematically in the following figure.

The type of connection to be employed depends on a number of factors. Each type of connection has certain inherent advantages.

Another reason for generating and distributing three phase power is the economy in copper resulting in a three phase system as compared to the single phase system. For a given investment in copper, a three phase power system can carry appreciably more power than a single phase system.

To measure the power consumed in a three phase system three wattmeters can be used. The current coils of each wattmeter are connected in series with one of the three phases. The free ends of the voltage coils must be connected to the center or neutral point (in the Y system) or in the delta system the three free ends of the voltage coils can be merely connected one in each of two of the phase equal to the readings of the three meters.

The power taken by a three phase lead can also be measured with only

(Please turn to page 38)

Fig. 24-2.Star and delta connections for motors, generators, or transformers of the Three Phase Type

Through the wilderness along the Alaskan Highway. Iron Machines and Iron Men do their part in this recent achievement of the Corps of Engineers—the construction of the great Alaskan-Canadian Military Highway, 1943.

Alaskan Line Completed--- Instructions for Use

WITH the opening of the third and final link of the Alaska Military Highway Telephone Line from Whitehorse, Yukon Territory, to Fairbanks in Alaska, the first overland phone line from the United States to Alaska is now in operation. This 2,026-mile line is furnishing military communications for the United States Army "on the road to Tokio."

Construction by the Signal Corps and civilian contractors including Bell System crews, the telephone line extends from Edmonton to Fairbanks along the route of the Alaska Military Highway. Above Fairbanks it runs to Anchorage, Alaska, Paralleling the Alaska Railroad. It is being operated by Signal Corps officers and men and will serve to link the Continental United States with the farthermost outpost of our northern theatre of operations. With the completion of this telephone line, wire communications is assured to the motor transportation using the highway; the Northwest Service Command, headquarters of which are at Whitehorse; Army Air Force installations, and the Canal oil pipeline.

The line, which is constructed of Copperweld wire, provides more than a dozen channels—telephone, telegraph and teletype. The wire is only 30 percent copper, a steel core within a jacket of copper. The savings in this critical material, plus the strengthening qualities of the steel, are of great value, since the line must be continuously patrolled due to landslides and snowfalls.

On October 27 Colonel Wm. C. Henry addressed a letter to Clyde S. Bailey, executive vice president of the United States Independent Telephone Association, with the suggestion that the information in the letter be disseminated to the Independent telephone industry through the trade press or by the use of other means. We are reproducing the letter from Col. Henry.

"THE Chief Signal Officer desires that you be informed of the completion of land line communication facilities along the Alaska Military Highway to Fairbanks, Alaska. These facilities are now available for the movement of telephone traffic, and arrangements to accept official Government telephone calls for points along the Highway may now be completed. The attached list shows all points for which calls may be accepted.

"The communication facilities along the Alaska Military Highway are for the movement of official Government traffic only, and the completion of personal calls, or commercial calls of a non-Government nature is prohibited. On calls, the official nature of which is doubtful, the operator with whom the call is placed, should state to the calling party that facilities along the Alaska Military Highway are for the completion of official Government calls only. If, after the operator has made this statement, the calling party still wishes to have the call completed, then it should be completed in accordance with established practices.

"The official name has been changed from the 'Alcan Highway' to 'Alaska Military Highway,' and incoming calls to be completed over the facilities along the Highway will be answered with the phase 'U. S. Signals' instead of 'Alcan' as formerly.

"Outgoing and incoming calls for Fawcette, Wagner, and Little Smokey, Alberta, will be routed through the switchboard at Edmonton.

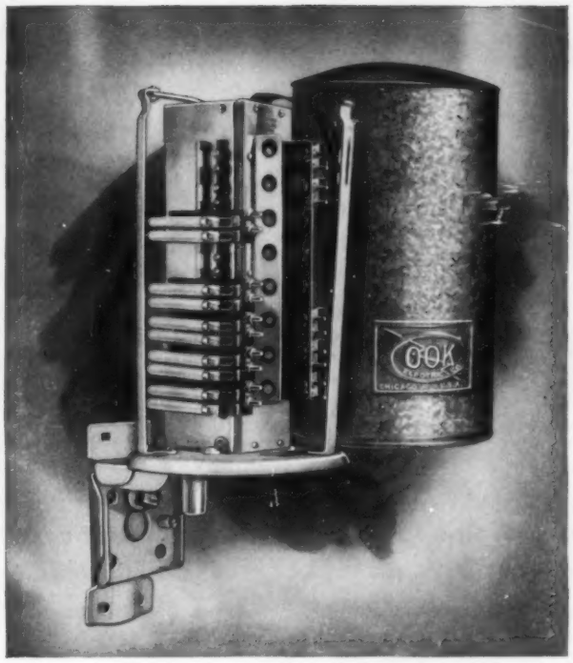
"Long distance calls to and from stations in Canada for Grand Prairie, and points north of Grand Prairie will be routed through the switchboard at Edmonton.

"Long distance calls to and from stations in the United States for points along the highway will be routed through the switchboard at Dawson Creek.

"Telephone Company message toll charges will apply only to points of

(Please turn to page 48)

Alaskan Highway under construction . . . Typical engineers camp seen from the mountain section of the highway.



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★

AN ENGINEERING LETTER

Calculation of Resistance Networks

***Here is more information on this interesting subject originally published in our August* TELEPHONE ENGINEER.**

In regard to Mr. L. S. Uphoff's article in your August issue, titled "Calculation of Resistance Networks," I would like to present a simplification of the method for determining the elements of unbalanced, or impedance matching, pads.

The method makes use of a balanced pad plus an ideal transformer having the desired impedance matching ratio. Using Mr. Uphoff's letter designations for the pad elements, we find from his table I the elements of a pad having the desired loss. We multiply these elements by the value of Z^1, the lower of the two impedances we desire to match. This yields a one to one ratio pad.

Assume that we have an ideal transformer (one which contributes no loss) connected to the end of this pad which is to be connected to the higher impedance Z2. The impedance transformation ratio of this transformer will be $R^2 = Z2/Z1$. If we had such a physical transformer so connected we would have the desired pad loss plus proper impedance matching. From such a theoratical network we can easily derive an equivalent three-element network which will properly match the impedance without the transformer, and will have the same loss.

The formulae for the elements of this equivalent matching network are as follows:

$$A' = A + C - RC \qquad 1.$$
$$B' = R^2 (A+C) - RC \qquad 2.$$
$$C' = RC \qquad 3.$$

Where A and C are the elements of the original pad. Element A′ is connected to the low impedance Z1, and element B′ to the high impedance Z2.

In the special case where it is desired to match two unlike impedances with a pad which will have the least possible loss, it is helpful to add some material to Table I so that such a pad may be found by inspection.

Formula 1 shows that if A+C is equal to RC, element A′ becomes zero. This is the condition for minimum loss. We therefore add a third column to the table giving A+C or each pad. Now we add a fourth column giving the ratio R of A+C to C. R^2 represents the desired impedance ratio Z2/Z1.

Now if we wish to find the elements of a pad which will match 600 ohms to 1280 ohms with minimum loss, we find the ratio 1280/600 = 2.14. Scanning the R2 column we find 2.14, and see that it corresponds to a pad loss of 8 db.

The matching pad elements will be two, B′ and C′. Our next step is to write for element C′ the value 1.357 from column 3, and to calculate the value of B′ from formula 2, $B' = R^2 (A+C) - RC$. B′ and C′ are now multiplied by 600, the value of the lower of the two impedances, to raise the pad to the desired impedance level.

The values 600 and 1280 were chosen for convenience. Any two impedances which are in the ratio 2.14 may be matched by a pad having 8 db loss.

Those who desire certain whole number ratios such as 2:1, 4:1, etc., will have to interpolate from the tables as these ratios require pads whose losses lie between two successive whole numbered values.

I include herein the information for pads up to 18 db, matching impedances in the ratio about 16 to one. Ordinarily it will not be required to match impedances whose ratios exceed 3 or 4.

The table may be helpful in other ways. If it is desired to match two impedances with some desired loss, the table reveals whether or not a pad of that loss is physically possible. For instance, a pad of 10 db will match impedances whose ratio is approximately 3. It is possible to build pads having any greater loss, but impossible to build pads having less loss, if the impedances are to be properly matched. Should we desire to match the impedances with, say an 8 db pad, we find from the table that it is physically impossible, as element A′ would have to have a negative sign. Hence a glance at the table may save some labor in the calculation of matching pads.

I hope this information may prove of some value.

Eugene R. Conly,
So. Calif. Telephone Co.,
701 E. Santa Clara St.,
Ventura, California.

Columns to be added to Table I for calculating matching pads of minimum loss.

RC (A+C)	R (A+C)/C	R^2 (Z2/Z1)
8.7284	1.006	1.012
4,4186	1.04	1.08
3.0102	1.06	1.12
2.3231	1.1	1.22
1.8248	1.18	1.395
1.6710	1.248	1.558
1.4986	1.343	1.80
1.3570	1.465	2.15
1.2924	1.59	2.53
1.2402	1.72	2.96
1.1725	1.92	3.67
1.1347	2.12	4.48
1.1055	2.35	5.5
1.0829	2.6	6.8
1.0653	2.91	8.45
1.0516	3.23	10.45
1.0406	3.612	13.46
1.0223	3.995	15.96

For this Christmas

A WISH AND A RESOLUTION

Out of another year of flaming war there has come a growing assurance that the old familiar Christmas Greetings need no longer be empty words. Today, the eyes of our fighting men are on the star of Victory. Through their valiant and tireless efforts in the cause of freedom, we once again have the privilege of wishing our friends a happy holiday season. More, our wishes take on new meaning, and a promise of better days to come.

But neither the wishes we express here, nor the greeting cards it has been our privilege to send our friends in more peaceful years, are enough today. We must resolve to continue and intensify our efforts here at home—to make certain that our forces on all fronts will never lack any of the tools of victory that we can give them. Only in this way can we speed the day when we can all partake of the fruits of peace—when we can again give full meaning to the age old wish—

Merry Christmas and a Happy New Year

AUTOMATIC ELECTRIC COMPANY

AUTOMATIC ELECTRIC SALES CORPORATION

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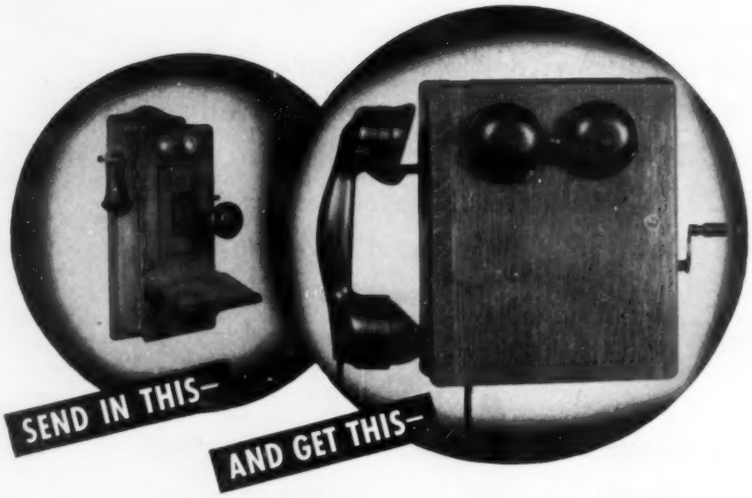

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LETTERS

from TELEPHONE ENGINEER readers

November 26, 1943

Dear Sir:

Inclosed please find press item appearing in the St. Paul Dispatch of Friday, November 19th. To my mind this case should be given space in your magazine, as there are still some of these cooperative telephone companies who believe that the law was created for someone else than the cooperative group, and this should be a fair warning to all.

I trust that you will find space for same and comments thereon in the coming issue.

Yours truly,
J. C. Crowley, Jr.
Secretary
Minnesota Telephone Association

◆

(Ed. Note: We are reproducing the mentioned article herewith with the idea that additional comment would be superflous.)

THREE PHONE WORKERS WIN PAY SUIT

Three employees at the Fosston, Minn., exchange of the Garden Valley Telephone Co. will receive $6,796 in unpaid minimum wages, overtime compensation and double damages as the result of a judgment signed by U. S. District Judge Charles J. Vogel of Fargo in an employes' suit brought under the Fair Labor Standards Act.

Judge Vogel ordered the cooperative to pay $622.70 to Agnes E. Strand, chief switchboard operator; $5,580.08 to Lena M. Bakken, night operator, and $593.69 to John P. Hanson, maintenance man, in addition to $750 in attorneys' fees.

The employe suit followed a previously signed consent decree which prohibited the Garden Valley concern from further violations of the federal wage and hour law and provided for the payment of $4,638.08 in back wages to sixteen employes.

The three employes, however, elected to bring suit for full restitution and double damages and won a verdict in which Judge Vogel held that a telephone exchange is not a "retail or service establishment" subject to exemptions and that it was operating in commerce within the meaning of the act, regardless of the number of interstate calls.

Major dispute in the case of Night Operator Bakken was whether she would get credit for hours between 1 a. m. and 6 a. m. when telephone calls were few and she was permitted to retire to a sleeping room. Five hours each night were deducted by the company.

25 YEARS AGO THIS MONTH

Taken from TELEPHONE ENGINEER files of December, 1918.

Twenty-five years ago, the news that Germany had capitulated to the allied armies and signed an armistice on November 11 was the signal for what was probably the greatest patriotic demonstration in the history of the United States. There was a general suspension of business, and the telephone business offices in most cities gave the employees a holiday in order that they might take part in the general merry-making.

According to the December, 1918 TELEPHONE ENGINEER, however there was one class of telephone employees who celebrated by sticking to their switchboards and handling a deluge of calls. Between nine and ten o'clock in Chicago the telephone was used more than during any one hour in the city's history.

★

The paper "snowstorms" which darkened New York, Chicago and other big cities during the earlier hours of the big armistice celebration November 11, 1918, were composed largely of erstwhile telephone books. As a result, the information boards of the various downtown telephone exchanges had the biggest day's business in their history.

★

The fourteenth annual convention of the Illinois Independent Telephone Association, it was reported in TELEPHONE ENGINEER of 25 years ago, was postponed because of the influenza situation.

★

Twenty-five years ago men of the telephone industry mourned the death of Mathias Klein, of Chicago, who passed away at the age of 92 years. Mr. Klein was a pioneer in the development of tools for the lineman and electrical mechanic.

"American" Maintenance Bodies Successfully Meet the Tough Signal Corps Assignments . . .

Practically all equipment that has gone to the various war theaters in "Uncle Sam's" service has been put to tests far more severe than any met in normal service at home in peace time.

"American" is proud of the fact that their Maintenance Bodies supplied to the U. S. Signal Corps have successfully met the toughest tests and been of real value in helping the boys in this service overcome many handicaps.

Today "American" is looking ahead and planning to meet the post war demands of the Utilities.

Much time and thought is being given to development and improvement of "American" Equipment and Bodies so that they meet even more fully than in the past, all service needs.

"American" appreciates that the best judges of any equipment are the men who use them so we sincerely invite suggestions.

We would suggest that you immediately start post-war planning. We are ready to cooperate with you to the fullest extent and will be glad to supply detailed information and drawings.

Some Reasons Why "Americans" Are TOPS:—
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PUBLIC UTILITIES EQUIPMENT FOR MOTOR VEHICLES

YOUR QUESTIONS ANSWERED FREE

Line AND Desk

Q. We would like to have some information on how cable splicer's platforms are constructed?

A. Cable splicer's platforms are generally locally made from 12" x ¾" white pine boards held together by crosspieces or cleats on the underside as illustrated in Figure 1. The corners are rounded to reduce the possibility of the end planks from splitting at these places. Holes are provided in the locations shown in the illustration for the supporting ropes which fasten the platform to the cable messenger and the guy ropes which steady the platform. The outside dimensions of the platform (4'6" x 3'6") do not vary greatly from the average for platforms used by different companies.

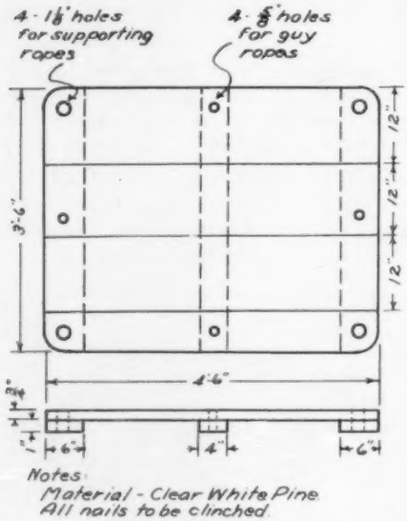

Fig. 1—Cable splicer's platform.

The Bell System has recently introduced a type of platform having a lengthwise opening in the center to enable the splicer to sit on the platform with his legs through the opening and his feet resting on a foot rope provided underneath he opening. This platform is smaller than the conventional type, being about 3' x 3'6" in size. A canvas trough is also provided for use underneath the opening to catch solder drippings and to keep the splicer's legs warm in cold weather.

Outdoor Temperature	Approximate Quantity of Paraffin Oil in Quarts for Each Ten Pounds of Paraffin
Above 75° F	None
75° or below	1
55° or below	2
35° or below	3¼
25° or below	4½
10° or below	5½

Q. What proportion of paraffin oil should be added to paraffin in making up splicing oil for boiling out cable?

A. The proper proportion for the paraffin oil mixture depends on the temperature of the surrounding air at the time the cable is boiled out. Formerly a mixture of paraffin with 20 per cent paraffin oil and a small amount of heavy mineral wax was employed, but this was found unsatisfactory for pulp-insulated cable because of the difficulty of stripping the paper insulation at low temperatures. This difficulty is overcome by increasing the oil content of the mixture with the decrease in outdoor temperature. The table above shows the approximate proportion of oil to use in the boiling out mixture at different temperatures. It will be noted that no oil is added to the paraffin at temperatures above 75 degrees, corresponding to summer temperatures.

Q. What is a fair comparison of the relative inductive influence of a single phase isolated power circuit with that of a multi-grounded Y system?

A. Assuming the multi-grounded Y system as having an inductive influence of 100% the single phase isolated system should be considered as having only 13% as much noise tendency.

These are rough values however and might vary widely in practice. They do illustrate, however, the fact that an isolated single phase power system has much less influence than the multi-grounded Y system. However from a practical stand point and except in isolated cases it is not normally feasible to use single phase isolated power systems because of their greater cost

Q. We have purchased a Western Electric type 84-D battery operated ringing machine for standby use during commercial power failure. Will you advise the recommended input and operating battery voltages for this machine?

A. The operating voltage range of the W.E. interrupter of the 84-D type is 0.60 to 0.70 volt. This is furnished by an Edison No. 502 primary cell (zinc and copper-oxide plates in caustic soda solution).

The ringing battery for the 84-D is usually a bank of 60 or more No. 6 dry cells conected in series. The actual voltage of the battery depends on the output ringing voltage desired, and this, in turn, depends on exchange ringing conditions. The range is 75 to 135 A.C. volts output. The ringing voltage of the 84-D, when the interrupter is properly adjusted, is 85 per cent of the input battery voltage. Thus, for example, 100 volts input battery would result in 85 volts A.C. output. We recommend as low an output voltage as possible consistent with satisfactory operation of subset ringers throughout the exchange.

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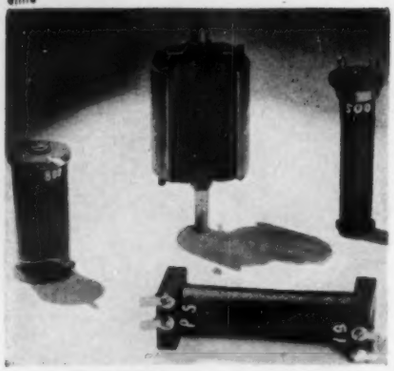

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NATURAL RUBY*
NATURAL GREEN*

**While present supply lasts*

SYLVANIA
ELECTRIC PRODUCTS INC.
SALEM, MASS.
Formerly Hygrade Sylvania Corporation

Wire Chief's Course

(Continued from page 27)

two wattmeters. In this case the current coils of the two meters are connected together. The total power is wires, while the two free ends of the voltage coils are connected to the third phase wire.

If the power factor of the load is 100% each wattmeter will read ½ of the total power. If the power factor is only 50% one meter will read zero and the other will read the total power, etc.

(TO BE CONTINUED)

Appraisal Being Made of Puerto Rico Telephone System

Newspaper reports are to the effect that negotiations for the transfer of the Puerto Rico Telephone Company, an International Tel. & Tel. Company subsidiary, will be undertaken in the near future. According to the report J. G. Wray, of J. G. Wray & Co., Chicago engineers is the representative of the government on the three-man board to conclude the transfer. John Wopat, Ft. Wayne, Ind., consulting engineer and Harry V. Wenger, Indianapolis consultant are the other members.

Also active in the transfer whereby the government will take over the telephone system under provisions of the franchises for communications on the island permitting federal purchase at the expiration of the contracts between the island's government and the utilities will be Forest F. Davis, assistant vice president of the I. T. & T., as well as as vice president of the Puerto Rico Telephone Company. Mr. Wenger is now in Puerto Rico, the report continues.

EXAMINATION No. 7

Basic A.C. Theory

1—Why is alternating current inherently generated in every generator?

2—Describe the voltage or current variation which takes place in an A. C. circuit.

3—Define the terms: (1) cycle, and (2) frequency.

4—What is an A.C. sine wave?

5—If the maximum (peak) voltage of an A.C. generator is 2000 volts what is the effective voltage?

6—Are A.C. instruments such as voltmeters, ammeters, etc. calibrated in terms of average peak, or effective values?

7—Why does a coiled conductor offer a greater retarding effect to the flow of A.C. current than does a straight conductor?

8—Compute the inductive reactance at 60 cycles of a coil whose inductance is 10 henries.

9—What are the factors that control inductance?

10—Compute the capacity reactance at 1000 cycles of a condenser whose capacity is 0.2 m.f.

11—Compute the current flow through an 8 m.f. condenser when connected across a 110 volt 60 cycle circuit.

12—What is the total capacity of a 2. 4. and 6 m.f. condenser when connected in parallel?

13—Compute the total capacity of a 2. 4. and 6 m.f. condenser when nected in series.

14—Why does maximum current flow in a series resonant circuit at resonance?

15—Explain how the phenomena of series and parallel resonance is made use of in typical radio circuits.

16—Define the term impedance.

17—Compute the impedance at 60 cycles of a coil where inductance is 2.0 henries, and effective resistance 100 ohms.

18—Compute the total impedance of an A.C. circuit at 1000 cycles which has in series, a 0.1 m.f. condenser, a 2.0 henry inductance (assume resistance of inductance coil is zero), and a resistance of 300 ohms.

19—Explain what is meant by the term "in phase."

20—Explain the essential difference between single and three phase power.

Highlights of the Communications News

(Continued from page 21)

manded. Therefore he cited the utility industry has to have as essential a continuous flow of additional equity capital and its tax structure must be one to permit such a flow and its financial integrity.

Wage-Hour

HOW the imposition of a 40-cent-per-hour minimum wage will in all probability drastically curtail employment of switchboard operators and will expedite the conversion of manual exchanges into dial service was described by several spokesmen for the Independent telephone industry in the recent hearings in New York before examiners of the Wag-Hour Division of the Labor Department. Whether the presentation was forceful enough to persuade the Division to reverse the recommendation of the Industry Committee No. 69 which by a 10-5 vote had supported the immediate institution of the 40-cent wage rate three years before the law would automatically make it effective could not be forecast, but it was felt that the witnesses for the U. S. Independent Telephone Association had brought out the Industry Committee's recommendation had not been based on adequate evidence.

Two hearings were staged before the Wage-Hour Division on the wage situation in the Independent telephone industry. One lasted two full days and a night on the immediate effectiveness of the 40 cent minimum wage and the other for an afternoon delved into the proposal of the Independent industry to extend the operator "learner" period from the present time of 320 hours to a year with graduated scales of increased pay as the "learner" period progressed.

The 40-cent minimum wage case is to go next before Wage-Hour Administrator L. Metcalf Walling for oral argument and, while the usual course for such an argument is three weeks from the time of the hearing, the USITA asked for a postponement until about January 15. The Independent industry is to file briefs on the question of the extension of the operator learner period and no argument before the Administrator is to be scheduled.

Basing his contentions on the facts that the cost of living is lower in small towns than in cities, R. J. Sutherland, USITA special counsel who is the attorney for the Central Group of General Telephone Companies, asked the Wage-Hour Division to consider the proposal of exempting exchanges of 2,000 or less telephones from instituting the 40-cent minimum wage. Personnel Director L. F. Shepherd of the Central Group of General Telephone Companies, brought out the 40-cent minimum wage would threaten the curtailment of 46,049 operators out of the Independent industry's 55,000 operators—10,560 through the curtailment of the present extra telephone services such as weather, time, market report and even social telephone calls and 35,489 in rough dial conversion. Mr. Shepherd

Type T Main Distributing Frame

The Type T is equipped with a moisture-proof, roomy but compact steel corebox with a rubber gasketed steel cover, conserving space and facilitating installation and handling. No silk or cotton tip or cable splicing is required for the regular paper-wrapped lead cable is brought directly into the corebox. Other Type T features include a metal fanning strip with insulating bushings in fanning holes and a white designation strip for quickly and clearly numbering pairs.

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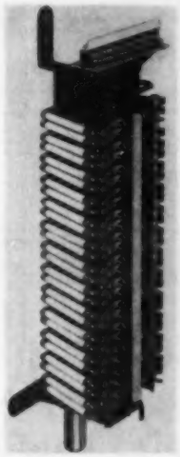

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The famous Cook self-soldering nozzle insures tight joints. Rubber-covered rings for neatly distributing cross-connection jumpers, solder clips for both ends of jumpers, and strong, rigid wall mounting brackets combine to make the Type T the ideal main distributing frame and central office protector mounting for offices or unattended exchanges that must meet high quality performance specifications at reasonable cost.

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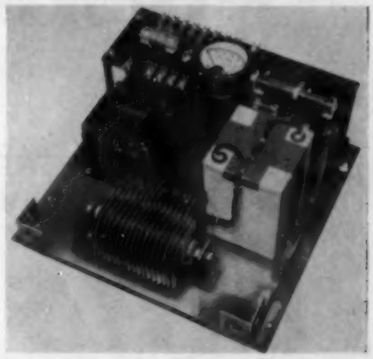
- Require no maintenance because they have no moving parts . . . nothing to wear out.



Typical curve of D.C. output voltage under varying loads indicating uniform voltage for proper operations of automatic telephones

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MANY telephone companies, foreign country buying agencies, departments of U. S. Signal Corps and others interested in purchasing telephone equipment and supplies have, in the past, ordered several EXTRA copies of the Telephone "BLUE BOOK" & BUYERS' GUIDE in addition to the single copy each subscriber of TELEPHONE ENGINEER & MANAGEMENT is entitled to receive.

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estimated that over 8,000 of the present 10,517 manual exchanges in the Independent industry were in exchanges of up to 350 telephones. Harry W. Pike, Rates and Tariffs Engineer of the Commonwealth Telephone Co. (Madison, Wis.), described the Bell System and Independent telephone coverage, pointing out that in Wisconsin the Independent industry operates 72.8% of the farm telephones.

At the outset of the Independent industry's presentation, Executive Vice President Clyde S. Bailey of the U. S. Independent Telephone Association, made a most persuasive appeal to the Wage-Hour Division to recognize that the Industry Committee's 40-cent wage recommendation was not supported by evidence and had not been based upon adequate investigation as the Committee had only met for a single session of a few hours. The Wage-Hour Division Examiner, however, rejected his motion to dismiss the proceedings.

Might Affect Life of Independent Companies

MR. BAILEY told the Wage-Hour Division examiner that there was no evidence to support the 40 cent wage recommendation which was arbitrary and without evidence so as to be antagonistic to accepted principles of fundamental justice. He urged that the Division provide for a separate classification for the Independent telephone industry which the Committee had utterly failed to do. He cited that the Wage-Hour study on cost of living had covered cities in which only one Independent company operated.

Many Independent companies believe that substantial increases in their present payrolls will seriously affect their ability to survive, Mr. Bailey stated. He pointed to the fact that they cannot obtain rate increases not only because it would mean the loss of subscribers but such rate boosts are opposed as inflationary by the OPA Utilities Division. A large number of the Independents operate in the smallest towns and farm communities and never have been able to earn anything even approaching a fair return on their plant. He contrasted the living expenses in the small towns where persons are often self-sufficient in raising produce with the conditions in cities. All these factors, he stressed, had to be taken into consideration in contrasting the minimum wages paid in cities and in the small towns. He added that the Independent wages in these small communities were not substandard and an increase of 10 cents an hour would mean the difference between the business success or failure of a small telephone company.

The Independent companies are unable to pay the wage rates of the Bell System because of their lower subscriber rates and lack of toll business. He cited the average per station revenue of the Bell System companies as $73.42 and the average for Independent Class A companies as only $40.53,

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while comparable figures for the Class B and Class C companies would be much lower. After reviewing the history of the Independent industry and showing that Independents operate in the less profitable field, the small towns, Mr. Bailey pointed out that many of the Independents have never paid a dividend.

In regard to dial conversion, he told the Wage-Hour Division that the increased wage scale would force the small companies into automatic operation with the elimination of many employees. He declared that in small communities the telephone company represents a good percentage of employment opportunities and "curtailment of employment hurts a community." However, during the war with the restrictions on critical materials by the WPB, Mr. Bailey related that conversion cannot be wholesale and is difficult to be authorized. He urged the Wage-Hour Administrator to give attention to the possibility of the 40-cent starting wage as causing considerable curailment of employment and said that many telephone operators who had been with Independent companies for 30 or 40 years would now have their jobs jeopardized. The industry, he added, is appearing before the Division in their behalf and "the Fair Labor Standards Act should be so administered as to make it live up to its name." He also described the tax burden now placed on telephone companies and stated that the postwar outlook for many smaller companies "is not reassuring" because of the higher taxes and increased operating expenses with inability to obtain rate increases.

Wage Boost for Operators Would Curtail Service

THE Independent industry was "caught" between wage regulation on the one hand and the OPA ceiling on telephone rates on the other hand, Mr. Shepherd told the Wage-Hour examiner. The curtailment of service would eliminate all inter-exchange calls, he continued, community of interest calls as well as other service calls which customers in their localities had come to depend on in telephone service, such as "time of day" calls, weather calls, awaken (alarm clock) calls, market reports, results of sporting events, etc. The curtailment of operators would also have the effect of eliminating night calls except for urgent cases, Sunday and holiday calls.

"Influence of wage control," Mr. Shepherd said "is driving telephone operation into dial service as fast as mechanization can be accomplished with the trend being to eliminate the small manual exchanges." He cited that his company, the Commonwealth, had recently installed a dial exchange at Winter, Wis. He emphasized that there should be a relationship between the learner operator period of training and the minimum wage.

The separate hearing on the operator learner period was directed for the USITA by John H. Agee, Vice-President and General Manager of the Lincoln, Nebr., Telephone & Telegraph Co. and chairman of the Association's Employment Relations Committee. Mr. Agee put on two witnesses, Mrs. Mayme Workman, Traffic Supervisor of the Illinois Telephone Association who stated that she represented the Commonwealth Telephone Co. Mrs. Workman described the working conditions and high morale of telephone operators. Mr. Shepherd submitted a gradual scale of pay for learner operators over a year with different rates of pay based on the size of exchanges. The pay rates for learner operators would be broken into two three-month periods and a final six months. This exhibit, Mr. Shepherd declared, represented the industry's best judgment as a workable scale for small Independents.

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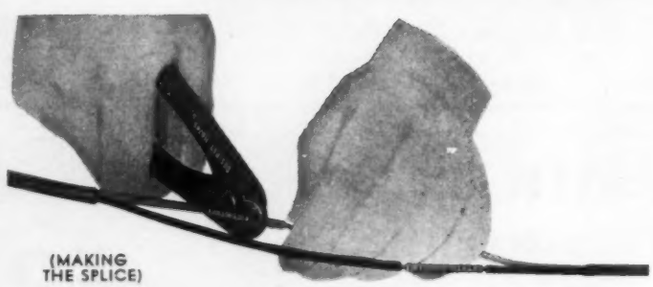
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Table of Wage Rates for Learner Operators

THE most important exhibit of the Independent industry in the learner hearing was of that of Mr. Shepherd who said it had been found workable and practicable by companies. This table is shown above.

The testimony of the representatives of the Independent industry in both hearings was subjected to cross-examination by the spokesmen for the unions —President J. F. Beirne of the National Federation of Telephone Workers and International Representative William Burke of the American Communications Association (CIO) who admitted that his union only had organized one Independent, the Northwestern Telephone Co. of Freeport, Ill. The NFTW cited that it had between 500 and 1000 members in various Independents in Nebraska, Pennsylvania, New York and Ohio but that the vast majority of its membership was in the Bell System. Besides the effect of the minimum wage on employees of Independent companies, Western Union opposed at the hearing its imposition in the case of telegraph messengers. Other representatives of the Independent industry who attended the sessions were President Richard A. Lumpkin of the Illinois Consolidated Telephone Co., Vice President T. A. Boyd of the General Telephone Corp., President S. A. Lane of the Western Arkansas Telephone Co.

Anti-Slug Bill

CITING that the losses in 1942 from the use of slugs in pay station telephones for the Bell System was approximately $300,000 and for the Independent industry amounted to between $50,000 and $75,000 Clyde S. Bailey, Executive Vice President of the U. S. Independent Telephone Association, Dec. 7, urged the Senate Judiciary Committee to approve the Reed Anti-Slug Bill which would outlaw the manufacturing, advertising and sale of such devices.

For several years the telephone companies have been victimized by these "chislers" who place slugs in coin-operated telephones in public places, Mr. Bailey stated. Besides the loss or revenue for telephone service, he noted that the slugs sometimes jammed the channels of the telephone coin boxes so that the sending of a repair man to the pay station is necessary. The use of the slugs is not ascertained until the coin box is opened for the periodic collection of its contents by the telephone company representative, so that it may be days or even weeks after the slugs have been deposited.

The number of coin-operated telephones in the United States is between 675,000 and 700,000 of which the Bell System companies have about 600,000 and the Independent industry the remainder. Mr. Bailey appeared before a Senate Judiciary Sub-Committee, composed of Senators Austin (Vt.) and Revercomb (W. Va.) both Republicans, and Hatch (D. New Mex.).

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A SECRET glass "batch-mix" — climax of 87 years of experience—plus Owens-Illinois quality-controlled production, results in Hemingrays free of voids, stresses and strains . . . so homogeneous that sudden changes of temperature leave them unimpaired to work perfectly through sun, rain, hail, snow and sleet.

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Personalities

Walter S. Gifford, left president of the American Telephone and Telegraph Company, receives the Vermilye Medal of the Franklin Institute, Philadelphia, from **C. S. Redding,** president of the Franklin Institute. The Medal is "in recognition of outstanding contribution in the field of industrial management."

Mr. Gifford's award, the Vermilye Medal, bears the name of its donor, **William M. Vermilye,** vice president of the National City Bank of New York. It was awarded to **William S. Knudsen** in 1941, when **Knudsen** was Director of the Office of Production Management. The first recipient, in 1939, was **Lewis H. Brown**, president of the Johns Manville Corporation.

•

Howard O. Leinard, assistant to the vice president of the American Tel. & Tel. Company with offices in Cleveland, has recovered from his recent illness and is now back on the job.

•

Oscar Burton, vice president and general manager of the Gulf States Telephone Co., Tyler, Texas and president of the Texas Telephone Association, is a true harbinger of Spring although Winter is just beginning. Comes to the Editor a personal invite to attend the Texas convention next March which we herewith accept!

•

Frederick W. Goosman, 68, active in telephone maintenance for a 45-year service record died at his home in Los Angeles, Calif. late in October. Originally starting his career in Boston, Mass., he served for the past 35 years with the Southern Calif. Telephone Company, retiring in 1940.

•

L. A. Mills, manager of the New Ulm (Minn.) Rural Telephone Company, had storm trouble last month as did most of Minnesota and Wisconsin. Many lines were down all over the two states with poles unable to stand the strain of the unusually heavy storm.

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Verne Clark, manager of the Middle States Telephone Co., Pekin, Ill., attended and was principal speaker at the annual banquet of the Wisconsin Locally Owned Telephone Group at their meeting in Madison last month. Mr. Clark is active in the Illinois association as a member of the advertising committee and his talk to the Badger telephone men was along these lines.

●

J. D. Kratz, Footville, Wis. was re-elected chairman of the Wisconsin Locally Owned Telephone Group, **T. H. Sanderson**, Portage, and **C. H. Wiswell**, Elkhorn, were re-elected vice chairmen, **A. H. Bowden, Almond** and **L. M. Lamkins**, Manawa, were re-elected treasurer and secretary respectively.

●

E. C. Blomeyer, chairman of the USITA Post-War Plans & War Activities Committee, and his National Association committee scooped the telephone trade press last fortnight by issuing their War Activities Bulletin explaining the changes in the WPB Communications Division Amended U-2 Order. This Committee deserves all praise for its work for the Independent industry through the National Association.

●

Mrs. Frank E. Bohn, wife of the president of the Home Telephone & Telegraph Co., Ft. Wayne, Ind., passed away on November 17 following a three weeks illness.

●

David T. Siegel, founder and president of the Ohmite Manufacturing Company, Chicago, has been elected to the board of trustees of the Illinois Institute of Technology.

●

H. H. Burrell, previously president-manager of the Mexican Telephone & Telegraph Company and with the International Tel. & Tel. Co. since 1926, has been made industrial relations director of the Federal Telephone & Radio Corp., an I. T. & T. subsidiary.

●

C. L. Jones of the Athens (Ohio) Home Telephone Company sent us a tear sheet of one of the series of newspaper advertisements his company is running in their territory. The ad is in the type of a weekly letter from the local utilities to its customers and should be very effective.

●

F. J. Huffman, division commercial manager of the Evansville, Ind., area of the Indiana Bell Telephone Co., died on October 1 following a heart attack. He had been on leave of absence for several months. His service to the company almost rounded out a 40-year record.

●

Curtis W. Stout, district manager of the Southwest Telephone Company at Stuttgart, Arkansas, a telephone pioneer of 49 years service, died recently at Little Rock.

●

L. A. Gritten, formerly of Forest Grove, Ore. and now commercial superintendent of the West Coast Telephone Company, Everett, Wash., was presented with a streamlined radiator-cooled, super de luxe "clipper" pipe by the boys from the Plant department at Forest Grove. The description of the pipe is culled from the current issue of "Crosstalk" issued by the company.

●

Walter L. James has been elevated to wire chief of the Everett, Wash. district of the West Coast Telephone Company.

●

Earl M. Gladden, general commercial manager of the Michigan Bell Telephone Co., for the past 24 years, last fortnight was elected a vice-presi-

CHANCE

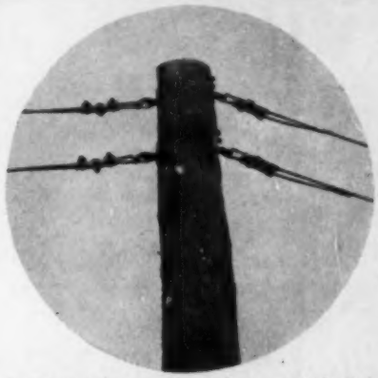
THIMBLEYE

Guying Fixtures

★ **Speed up**

★ **Simplify, and**

★ **Improve Construction**



Thimbleye Guying Fixtures, manufactured by A. B. Chance Co., help to get the job done on schedule by saving time and energy. They do better guying and save a lot of guy strand. The curvature of the Thimbleye protects the guy strand against distortion and makes it easier to pull the strand through the eye when taking up slack. Guys may be attached on the ground. Write for complete details.

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THE LORAIN PRODUCTS CORPORATION
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dent of the company. **Ben R. Marsh**, assistant vice-president, succeeds **Mr. Gladden**.

•

W. R. McIntire, a former Weber County Commissioner, has been appointed on the Utah Business Regulation Commission, succeeding Commissioner **George S. Ballif** who is resigning to enter private law practice. Commissioner **Donald Hacking** has been named chairman of the Commission. **Mr. McIntire** takes office Dec. 15.

•

Ervin James, assistant to Commissioner Clifford J. Durr, was appointed assistant secretary of the FCC, a post which had been vacant since the retirement of **John B. Reynolds** on Feb. 1, 1941, to enter the broadcasting industry.

•

Colonel Ira Treest, Chief of the Communications Engineering Branch of the Signal Corps' Army Communications Service, is retiring from the Army next March 31 because of physical disability. He is being succeeded by **Lt. Col. Vernon B. Bagnalls**, who is now Acting Chief of the Branch, but is slated to be made the permanent chief later. **Col. Bagnalls**, who is in civilian life a radio engineer in the

Long Lines Engineering Department of the American Telephone & Telegraph Co., has been on active duty with the Army Signal Corps since Jan. 1, 1941. **Col. Bagnalls** joined the A. T. & T. Long Lines Department in 1927 following his graduation from the University of Wisconsin. He has been a reserve officer in the Army since 1927.

•

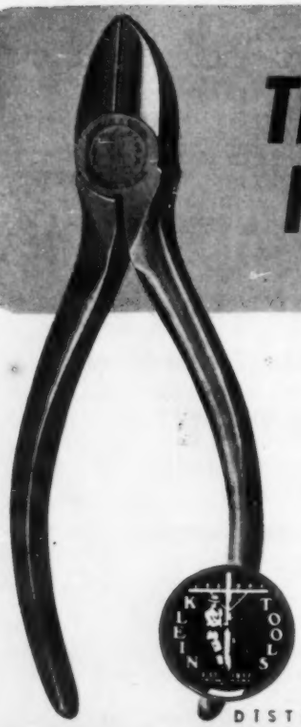
Nazis Obliterate Naples Telephone Facilities

The almost complete obliteration by the Nazis of the telephone facilities of Naples was reported by the Allied Military Government officials to Secretary of the Treasury Morgenthau for inclusion in the latter's report to President Roosevelt.

According to the information supplied to Mr. Morgenthau by the AMG, the Germans before retreating from Naples blasted the telephone exchanges, severed lines, and dynamited power plants which fed energy to the city's entire communications system.

The report of the extent of the destruction by the Germans of communications along their line of retreat points up the significant task confronting American telephone and communications specialists and engineers in rebuilding these vital links in captured territory. Certainly if the destruction in Naples is any example of the lengths to which the Germans will go in paralyzing communications in evacuated cities, the demands on American production of replacement equipment even for limited temporary service, will be very greatly expanded. The rehabilitation of communications systems in reconquered territories is producing a new category of purchaser or "claimant agency"—the Allied Missions which are taking over direction of the government operations in those countries.

These Are Tools For War, Too!



All the tools of war aren't guns, shells, tanks, mortars or other weapons. Pliers, wire-cutters, splicing clamps, and many similar items play an important part. With the armed forces, and with those at home too, these tools are helping us win the biggest war in all history.

Because they are important to the war effort, your tools deserve good treatment. Klein Tools, especially, are so sturdy and dependable they'll last well beyond any duration if you'll give them reasonable care. But, when you do need new tools, specify Klein, and we'll do our best to meet your needs promptly.

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THE PIONEER'S CORNER

As I look back over more than thirty-five years of telephone experience I am more than ever impressed with the vastness of the present telephone communication system that has developed from such a small beginning in so few years.

Mirrored upon the walls of memory are the countless changes of methods, design and construction that has made possible the expansion of the human voice into the most remote parts of the world and over multiplied thousands of miles of distance linking together the peoples of the earth into one vast neighborhood.

It is a far call from the neighbor to neighbor magneto telephone connection to the continent to continent conversation that today spans the vastness of oceans, the loftiest mountains, barren wastes and populated centers virtually encircling the globe.

The marvel of it all is that it has come within the memory of those living today. Perhaps this is the thing that gives the thrill to the "Telephone Pioneer". The feeling that he or she has been part of this almost unbelievable accomplishment.

Is it surprising that we of the Independent Pioneer Association have banded together to perpetuate the romance of development in such a great industry? I think not, and this accounts for our desire to encourage others who are eligible to join with us and get the feel of the Pioneer spirit.

Sincerely,

J. Warren Safford
President and General Manager
Troy-Tipp Telephone, Inc.

(Membership in the Independent Pioneer Telephone Association is open to all Independent telephone People. Application blanks may be had by addressing Secretary J. K. Johnston, Lemcke Bldg., Indianapolis, Ind.)

THEY WANT TO KNOW IF WE'LL TAKE THE CALL "CHARGES REVERSED"?

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If an item you've always used is unavailable and an alternate must be selected, GRAYBAR can serve you unusually well. GRAYBAR's nationwide contact with independent telephone companies brings to light a wide range of service experience — minimizing "trial-and-error" on your part in selection.

In addition, one call to GRAYBAR is a fast, effective link with a *long list* of leading suppliers. The burden of checking individual sources for the item you need is eliminated.

Why not make GRAYBAR your "materials mobilizer" for the tools, hardware, insulators and other supplies essential to wartime service on the home front? Just call your local GRAYBAR office.

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Everything Electrical .... THAT IT TAKES TO WIN!

IN OVER 80 PRINCIPAL CITIES

Executive Offices: GRAYBAR BUILDING, NEW YORK 17, N. Y.

Alaskan Land Line Completed

(Continued from page 24)

connection with the facilities of the Alaska Military Highway system. It is contemplated that no message toll charge will be made at this time for that portion of the haul beyond the point of connection.

"It is suggested that the information contained herein be disseminated to all members of the association by letters, through the several industry magazines, or by any other practicable means."

Accompanying the letter is a list of locations having access to telephone circuits along this important communications link, as follows:

1. **In Alberta**
   - *Edmonton
   - *Fawcett
   - *Wagner
   - *Little Smokey (formerly High Prairie)
   - *Grand Prairie
   - *Peace River
     U. S. Engineers only
   - *Commercial service is also available at these locations
   - *Access to commercial circuits via Alaska Military Highway circuits is *not* permitted
2. **In British Columbia**
   - Dawson Creek
   - Fort St. John
   - Blueberry River
   - Trutch (formerly Conroy Creek)
   - Fort Nelson
   - Testa River (formerly Summit Lake)
   - Muncho Lake
   - Coal River (formerly Turnagain River)
3. **In Yukon Territory**
   - Watson Lake
   - Swift River (formerly Seagull Creek)
   - Teslin Lake
   - (Whitehorse (also known as McCrae Repeater Station)
   - Canyon Bridge
   - Kluane Lake (formerly Destruction Bay)
   - Koidern (formerly Lower Canyon)
4. **In Alaska**
   - Anchorage
   - Northways
   - Cathedral Bluff (formerly Tanacross or Tana Crossing)
   - Big Delta
   - Fairbanks
   - Ladd Field

Obituary

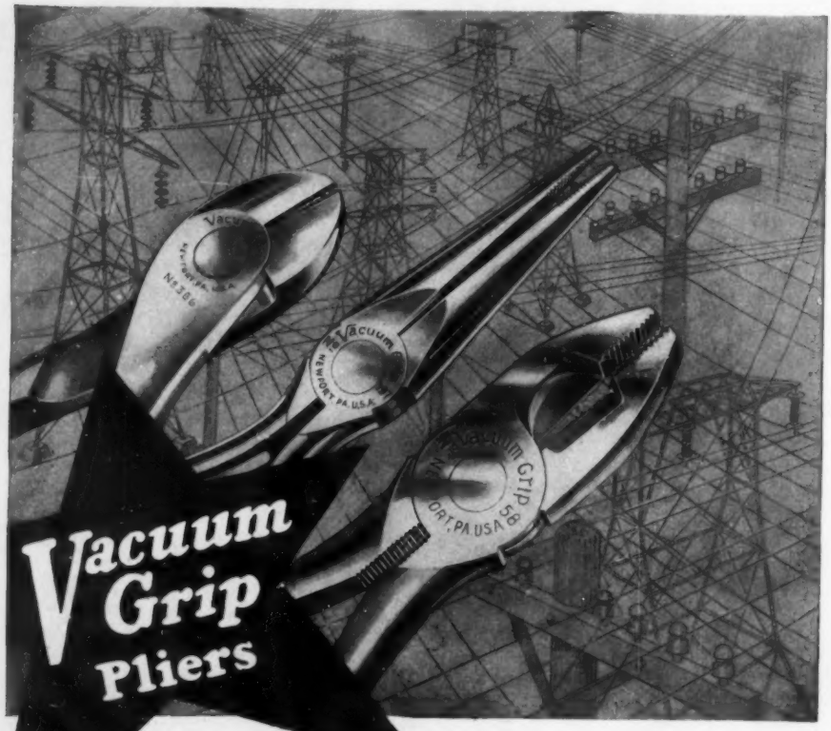
George S. Weedon, of Atlantic Highlands, N. J., vice president and secretary of the New York Telephone Company, died suddenly on Friday, October 29, 1943, after becoming ill while on his way to his office at 140 West Street. Born December 8, 1881, in Brooklyn, he was in his sixty-second year.

Mr. Weedon entered the company in 1906, taking charge of a departmental stenographic bureau. In 1907 he became chief clerk to the general contract agent, and in 1912 chief clerk to the general manager.

Utah Company Sold

The controlling interest in the Bear River Valley Telephone Company, Tremonton, Utah, has been acquired by Vincent Chiodo of Des Moines, Iowa. The new owner was connected with the Bell for the past 18 years and will actively operate the property. Newspaper reports state that certain improvements in service will be made as quickly as materials and manpower are available.

Paul Heitz, former manager and secretary of the company is now residing in California.



STAR PERFORMERS *of the* "RED-WHITE-AND-BLUE" NETWORK

AMERICA'S "network" of wires for maintaining communications and supplying light and power to the Nation—a gigantic system. Joined as a single strand it would girdle the Earth—many times!

In the servicing of this vast "Red-White-and-Blue" network, Vacuum Grip Pliers occupy a conspicuous position, not only numerically but by reason of their high standard of performance and amazing ***durability.***

Normally, this durability would spell only Economy. Today, under the existing small tools shortage, a pair of Vacuum Grip Pliers becomes an almost priceless possession, through the ***extended service*** assured by its abnormally long life.

FORGED STEEL PRODUCTS CO.
NEWPORT, PA.

Tree Trimming Practice

(Continued from page 24)

trees on the right of way adjacent to his land.

On certain occasions the owner may verbally consent to have his trees trimmed but declines to sign the permit. In this case, the owner should be requested to oversee the tree trimming operations on the right of way abutting his property or have his agent do the supervising.

Naturally it is very important that, once permission has been secured to do this work, all agreements be followed to the letter. The work must be neatly done, and all tree branches and foliage removed in the trimming process must be taken away unless the owner specifically requests that the branches be left for his use.

Tree Characteristics

A KNOWLEDGE of the various **characteristics of trees** growing in the locality is of considerable help in determining the extent of pruning necessary to maintain satisfactory line clearances and at the same time avoid ruining the appearance of the trees or injuring them physically.

Trees of various species differ in their manner of growth. Tree species such as the Ailanthus or Tree of Heaven, Box Elder, and Cottonwood grow very rapidly while others, such as the Walnut, Sycamore, and Oak develop slowly. Fast growing species require twice as much clearance as the slower growing kinds, sometimes more. Examples of slow and fast growing species found throughout much of the country are as follows:

Slow Growing Species

Ash
Beech
Birch
Sugar Maple
Norway Maple
Pine
Sycamore
All fruit and
Nut bearing trees

Fast Growing Species

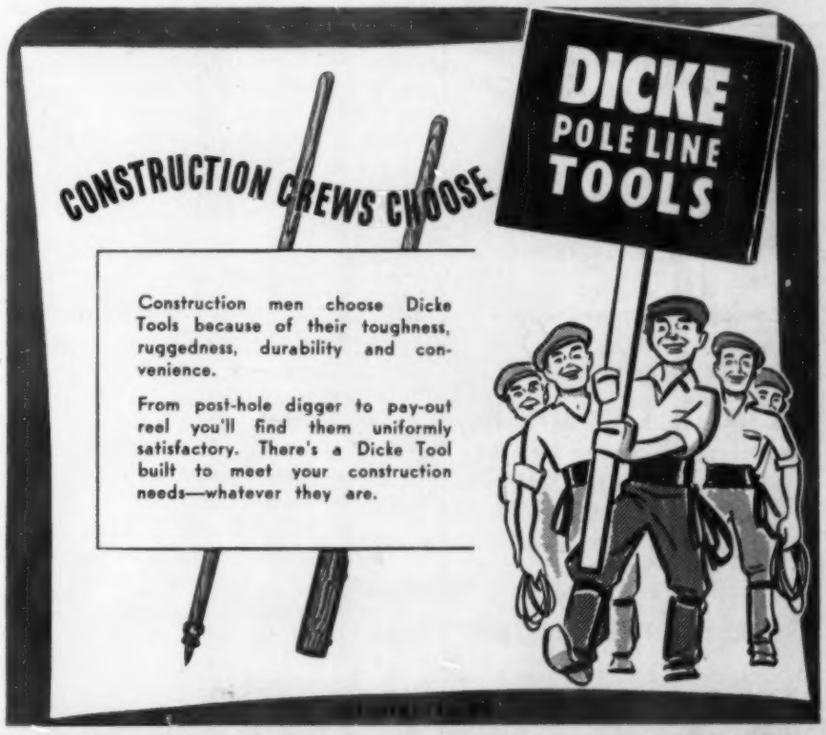
Ailanthus (Tree of Heaven)
Basswood
Box Elder
Catalpa (Indian Bean)
Cottonwood
Elm
Locust
Silver Maple
Lombardy Poplar
Willow

Climate and soil conditions also influence the rate of tree growth. Trees in the southern part of the country grow more rapidly than those of the same species in the northern part. Plant growth in moist, rich soil is more vigorous and rapid than like growth on dry, poorly nourished soil.

Another tree characteristic relates to its spreading habit. Trees tend to assume an upright, spreading or horizontal form according to their particular species. The American Elm, for example, is upright in form, having its branches growing at a rather sharp angle to the trunk. The Oak, on the other hand, has a spreading characteristic, while the Box Elder tends to grow more in a horizontal area than in the vertical direction, Figures 2 and 3 illustrate the difference in the spreading characteristics of the American Elm and the White Oak.

Trees having an upright form re-

You can cut up to 1½" branches easily with this TREE TRIMMER
This light weight, easy to use tree trimmer shears downward, taking advantage of gravity which spreads the cut behind the knife. There is no danger of wedging or choking. It's leverage ratio permits 1½ inch cuts with amazing ease. Extra extensions are spliced on by means of special ferrule and spring release. Get the complete details before you invest in tree trimming equipment.
A·B·CHANCE CO·
CENTRALIA, MISSOURI.


CONSTRUCTION CREWS CHOOSE
DICKE POLE LINE TOOLS
Construction men choose Dicke Tools because of their toughness, ruggedness, durability and convenience.
From post-hole digger to pay-out reel you'll find them uniformly satisfactory. There's a Dicke Tool built to meet your construction needs—whatever they are.
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SALES CORPORATION
1033 WEST VAN BUREN STREET • CHICAGO 7, ILLINOIS

Fig. 5—Black Cherry suppressed under line along state highway. (Courtesy of Forestry Dept., Consumers Power Co., Jackson, Mich.)

quire but little trimming where located to one side of the pole lead, but readily interfere with the conductors if grown directly in line with the lead. On the other hand, the Box Elder may grow directly under an open wire lead with little interference if sufficient pole height is provided, because of the horizontal form of the Box Elder, this species having a mature height of 40 feet or less.

Trees with a spreading or horizontal shape are easily trimmed at top but do not lend themselves to side trimming without serious effect on their appearance. Trees of an upright form can be under trimmed and, to some extent, pruned on the side but should not be topped.

The natural strength of a tree is another characteristic of importance in determining how much tree clearance to allow. Thus a tree of weak structure should not be permitted to overhang a wire or cable lead because of the danger of the limbs breaking of and falling onto the line. Also unsheltered weak trees should not be permitted on the windward side of a pole lead in localities having strong prevailing winds if there is danger that the trees will blow over onto line wires or cable.

Examples of the three general strength classifications of trees are as follows:

WANTED ENGINEERS

Telephone Project Engineer
exp'd in step by step telephone equipment

Telephone Circuit Designer
Experienced in step by step
DIAL TELEPHONE SYSTEMS
of American and European manufacturers

Telephone Equipment Designers
Experienced in step by step equipment designs

Write, stating full details of experience in first letter to Box 537 Commerce Advertising agency. 1457 B'way, New York 18, N. Y. Essential workers need release statement.

Tree Strength Classification

Weak	Easily Split	Strong
Ailanthus	Ash	Birch
Basswood	Linden	Elm
Box Elder	Magnolia	Hackberry
Catalpa	Persimmon	*Black Locust
Lombard Popular	Tulip	*Honey Locust
Sassafras		Hard Maple
Silver Maple		Oak
Willow		*Osage Orange
		Fruit & Nut Trees

*Thorns increase hazard of climbing these trees.

Many, although not all, fast growing trees have low fiber strength, while the slower growing species have more or less high fibre strength.

The amount of moisture in a tree is also a factor in determining tree clearances. Thus a willow or buckeye tree will cause more electric current leakage than a black locust tree for an equal amount of contact area of the foliage with the conductors of an open wire lead.

Clearances to be Obtained by Trimming

NO hard and fast rule can be applied for obtaining the proper degree of **tree clearance** on pole leads. Experience, together with an understanding of the characteristics of tree species common to the locality, is the only reliable guide to satisfactory tree clearance that takes into consideration the minimum interefence to wire lines as well as the welfare of the trees growing adjacent to the pole lead.

Figure 4 illustrates a good example of successful tree clearance by trimming methods.

Just the right amount of tree clearance should be provided so that a trimming cycle of two years or longer will result in the necessary freedom from interference with the lines. The proper amount of clearance that should be provided depends on the rate of plant growth and the position of the trees with respect to the line wires.

For a tree trimming cycle of two years under average conditions of climate and rainfall, it is ample to provide five or six feet of clearance from overhead wires to the top of the trees, three or four feet from tree branches for side clearance, and five feet of clearance from overhanging limbs.

However, if much of a tree must be cut back to provide the maximum desirable clearance with resulting damage to the welfare and appearance of the tree, the amount of clearance to be obtained must be reduced. With slow growing tree varieties, this is not such a serious matter as it is possible to reduce the optimum tree clearances to half the stated figures and still have a reasonably satisfactory freedom from tree interference between trimming operations.

The fast growing species are more difficult to handle if located so closely to the pole lead that extensive prun-

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Inc.

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P. O. STATION "A"
ATLANTA, GEORGIA

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Chromated Zinc Chloride

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486, pages, 6x9, 272 illustrations, **$5.00**

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Write for information.

THE CALCULAGRAPH COMPANY
308 Sussex St. Harrison, N. J.

CALCULAGRAPH

Accurate Toll Timing to the Second!

Whenever Direct Current Is Required from an A. C. Source

Remember B-L Metallic Rectifiers

BL METALLIC RECTIFIERS

Copper Sulphide or Selenium

from Milliwatts to Kilowatts

If you have an A.C.–D.C. conversion problem let our engineers help you. We have successfully produced many applications formerly thought impractical.

B-L Metallic Rectifiers have been favorably known to the electrical industry for many years for their reliability and efficiency.

We invite the submission of your A.C.-D.C. conversion problems. We are equipped to render a thorough engineering service—at no obligation.

Write today for Bulletin 73 giving full details about B-L Metallic Rectifiers.

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THE BENWOOD LINZE CO.

ST. LOUIS, MO.

Designers and manufacturers of copper Sulphide and Selenium Rectifiers, Battery Chargers, and D.C. Power Supplies for practically every requirement.

Fig. 6—Red Oak with natural symetry destroyed by line clearing. (Courtesy of Forestry Dept., Consumers Power Co., Jackson, Mich.)

ing is necessary to keep their growth down. The best remedy in such cases is to reroute the line wires by methods such as pole top rake, side arming, and pole line offset, or utilize tree wire.

In trimming for clearances, the possibility of clearances being reduced to an undesirable degree as the result of loads of snow or ice weighting down tree branches should be taken into consideration. This is especially true in cases of trees being under trimmed.

When Trees Should be Trimmed—Trimming Cycles

As far as the welfare of the tree is concerned, it makes little difference as to the time of the year a tree should be trimmed as long as only the minimum amount of pruning necessary is done and a sufficiently long period occurs between trimming operations to enable the tree to recover from the effects of the pruning.

However, it is the experience of telephone companies that tree trimming should be done in late fall, winter, or early spring. There are several reasons for this preference, namely, economy of labor, simplified pruning operations, and better public relations.

Work for construction and maintenance forces is usually slack during the winter months and the men who would otherwise be idle much of the time can be very satisfactorily employed in pruning trees along pole leads. This is true for small as well as large companies.

It is easier to visualize the appearance of a tree for the pruning operations when the leaves are gone than when the trees are in full foliage. A much better job of trimming thus results. This is especially the case when the men do not have the experience and judgment of trained foresters for determining the proper trimming operations to secure the desired appearance of the tree being pruned.

Property owners are not so likely to object to having their trees pruned when permission is asked for doing this work during the time the trees are bare of leaves. Summer pruning always seems to denude a tree when it is in full leaf due to unavoidable gaps being left by the removal of branches. The utmost care is then necessary not to leave too large or too many gaps in the tree foliage. Winter or dormant pruning, on the other hand, permits the removal of the same number of branches of a tree with little noticeable effect on the appearance of the bare tree. The tree will then fill out beautifully with the coming of spring and show little or no indication of having been pruned. The result, of course, will be that the property owner will appreciate the beneficial results of the pruning operations and be still more willing to permit re-trimming of the trees at periodic intervals.

The objection has been raised that winter is an uncomfortable and hazardous period for trimming operations. As a rule, such work can be carried

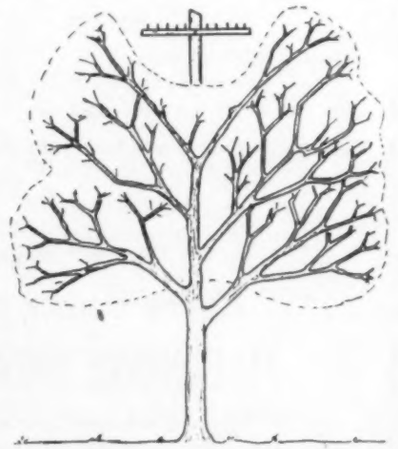

Fig. 7—Crown notching sometimes employed in case of trees that cannot stand heavy topping.

on late into December and resumed in late February or early March in all but the most northern localities. In communities farther south, the pruning operations can be carried on throughout the winter.

It was previously mentioned that tree trimming work should be done at regular intervals. The period between trimming operations is known as a **trimming cycle**. The cycle starts with the first pruning given to trees when the pole lead is built. At this time adequate clearance is obtained by proper line construction and correct relation of the poles to the trees in the right of way. The trees are shaped as nearly as possible in conformity with their natural characteristics. In addition, dead or unsightly branches are cut out and diseased or inferior trees are removed.

After the first trimming the trees are re-pruned every two years. This work is seldom as extensive as the original operation unless the line was so badly designed in the first place that severe pruning is needed to keep the growth away from the line wires. Such unrestricted pruning is demoralizing to the welfare of the tree and ruinous to its appearance, increases maintenance costs to an undesirable degree, and endangers good public relations. The physical effect of such indiscriminate pruning is illustrated in Figure 5.

The two-year cycle recommended is based primarily on considerations of economy to the telephone company, the well-being of the trees, and the protection of public and private property owner rights. Of course, fast growing trees may have to be re-trimmed oftener than every two years. Sometimes storm damage requires the pruning of trees to remove broken or split branches. On the whole, however, it is feasible to set up a regular two-year trimming cycle. A longer cycle may be established if adequate clearances have been originally provided but it is not recommended when severe tree pruning is necessary to regain the desired clearances. In general, it may be said that after two years trimming costs increase in proportion to the amount of plant growth to remove for each year of postponement of the pruning operations.

On private right of ways on which easement has been obtained for a pole line, much brush and coppice growth will be found. It is generally necessary to clear such growth every five years or so, otherwise it will eventually interfere with the line wires. Certain shrubs like the elderberry or sumac seldom grow very high and are best left alone as they tend to prevent the development of other and taller growths. As a rule, brush removal is seldom done on highways since such work is handled by highway maintenance crews.

Correct Methods of Pruning Trees

CORRECT pruning methods are quite essential to maintaining adequate line clearance without adversely influencing the well-being of trees. Merely removing only the branches that interfere or threaten to grow in the way of the overhead wires will not always result in the desired clearance and may be harmful to the welfare and appearance of the tree. The maintenace man who has occasion to trim trees should familiarize himself with the 'do's and dont's" of forestry principles applied to tree pruning.

One undesirable practice is that of cutting ragged notches in the tree crown for the purpose of clearing the line wires. A large notch such as that shown in Figure 6 upsets the tree's symmetry and completely spoils its appearance. Such ugly notches must be avoided by all means.

In the case of large trees growing in line with the pole leads and heavy topping is needed for clearance from

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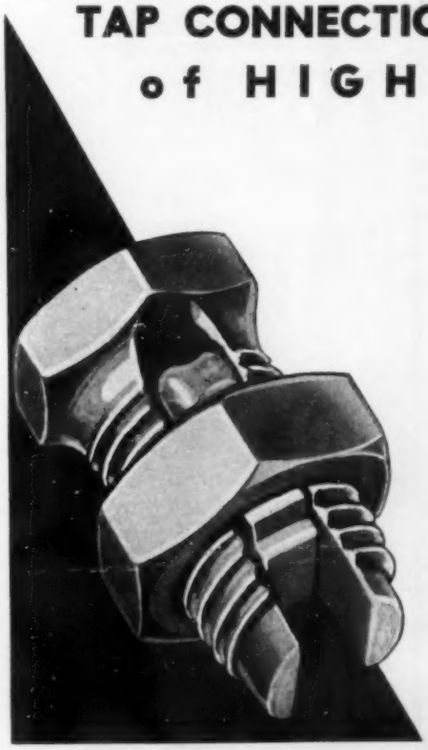
EXACT TEMPERATURE

Dillon Temperometer always reads the same. No chance for error. Instantaneous. Handy. Priced low to make the job right!

$6 each.

W. C. DILLON & CO. Inc. 5410 W. HARRISON STREET CHICAGO, ILLINOIS

TAP CONNECTIONS of HIGH STRENGTH at a Saving in Time and Cost



Reliable **BRIDGING CONNECTORS**

—offer a wide margin of strength over the actual field requirement, permitting the lineman to exert maximum pressure with the result of a positive, trouble-free connection. "Reliable" Bridging Connectors cannot be distorted with a standard telephone wrench. Easy to install. Request samples and prices.

"RELIABLE" IDENTIFIES THE QUALITY

Reliable ELECTRIC COMPANY

OVER 35 YEARS SERVICE TO THE UTILITIES

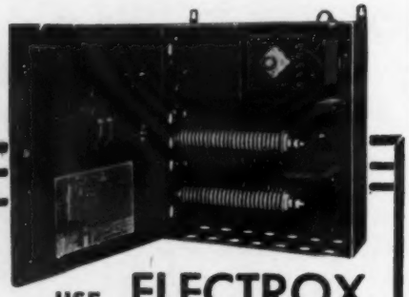
1201 CARROLL AVENUE CHICAGO, U.S.A.

Sturgis
WOOD OPERATOR CHAIRS

No. 222-FR

1. Form fitting back and deep, saddle seat upholstered in genuine leather over curled hair pads.
2. Easy, "floating" swivel mechanism.
3. Available in 4 seat height ranges: 18 to 22"; 21 to 25"; 24 to 28" and 28 to 32".
4. Solid maple frame with all joints glued and dowelled.
5. Wide choice of leathers and finishes.

Sold by Telephone Supply Houses
Manufactured by
STURGIS
POSTURE CHAIR COMPANY
Sturgis, Michigan



USE ELECTROX
RECTIFIERS
to Replace Your Batteries

• Supplies DC power for all types of telephone equipment.

BATTERY ELIMINATORS — with or without power-off relays for magneto operators' sets.

BATTERY ELIMINATORS—with constant voltage output for PAX and PBX, with or without sub-cycle ringer.

BATTERY CHARGERS — for trickle charging telephone batteries.

AUTOMATIC BATTERY CHARGERS — for exchange batteries.

Write for Additional Information

ARMY E NAVY
Awarded October '42.
RenewedSeptember'43.

SCHAUER MACHINE CO.
2064 Reading Rd. Cincinnati, Ohio

Fig. 8—Pollarded hard maple on R.E.A. line. (Courtesy of Forestry Dept., Consumers Power Co., Jackson, Mich.)

the wires, a process very harmful to mature trees. U-shaped openings in the upper crowns are often resorted to by many utility companies to avoid killing the trees by excessive trimming of the crown. Such an opening in a tree standing apart from others results in spoiling the tree's appearance. However, the U-shaped crown openings in a row of closely spaced trees under overhead wires are not so conspicuous.

Although state highway departments do not like the practice of notching tree crowns and a few forbid this method, it is sometimes necessary to trim a tree in this manner when excessive trimming will damage the tree. When a notch must be cut, it can be rendered relatively inconspicuous by rounding the corners of the notch and making the opening relatively wide-angled as illustrated in Figure 7.

Other incorrect methods of pruning a tree can either damage the tree or at least spoil its appearance. For example, excessive topping will kill a mature tree, though a young tree is usually unharmed by severe cutting back of its crown. A tree must never be pollarded (dehorned) as in Figure 8 since this permanently disfigures the tree. If permission can be obtained to cut down a tree that requires such heavy topping, the tree should be removed entirely. This is better than running the risk of public criticism by leaving the tree in a denuded condition.

Excessive trimming to the same line of tree contour will cause the tree to develop a bushy appearance as the result of the formation of clusters of twigs along the cut edge of the crown. Figure 9 shows the result of successive trimming to a single line along the periphery of the crown. Such a condition can be avoided by thinning out half of the new growth at each retrimming and retaining or heading back the rest of the growth.

(TO BE CONCLUDED)

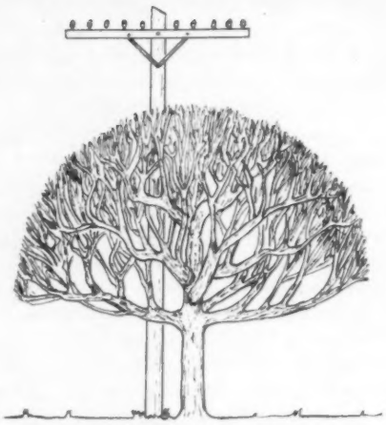


Fig. 9—Effect of successive trimming to the same line on the crown of a tree.

Big 3 Conference Has Special Exchange

During the historic conference near Cairo at which President Roosevelt, Prime Minister Churchill and Generalissimo Chiang Kai-Shek mapped out the program for the unconditional surrender of Japan and stripping of the Nipponese empire, the strictest secrecy in communications between the Egyptian capital and the outside world during the period of the meeting was maintained. In the setting of the parley news dispatches noting that special telephone directories and exchanges were prepared with each national delegation having its own colored directory. Because the British Government was host, the Royal Signals Force of the British Army, it was believed had charge of the communications setup. The period of the meeting was Nov. 22-26.

LATE MAIL DELIVERY

is not unusual these days. Patience is asked by the Postoffice Department if mail is slow.

ATTENTION, PLEASE!

If you plan to change your address, kindly send in your old as well as your new address. This applies particularly to service men. In order not to miss a single copy of your magazine, notify us immediately upon your transfer. And remember—DON'T forget to let us know your LAST address along with the new one.

Washington and Oregon Association Pass Resolutions

According to letters received by TELEPHONE ENGINEER from L. A. Gritten of the Oregon Association and from Ray Dalton of the Washington Association each association has passed resolutions on the pending tax legislation and have wired them to Senators serving their respective states.

The Washington resolution called attention to the proposed increases of taxes on telephone service in the form of excise taxes and requested the tax committee to avoid the increasing of taxes above their present levels and the imposing of further taxes on such services which are not also imposed on all business.

The Oregon resolution filed called attention to the legislative body on "excess profits" and requested to Congress to amend the present law with an alternative method of calculating profit credit as proposed by Mr. Bozell of the USITA to the House Ways and Means Committee.

Termites In Africa Too!

One the the major problems arising to plague Signal Corps soldiers in North Africa is the presence and voracity of the termites there. They interfere seriously with pole line construction and it has been found that the only effective way to deal with them is to treat the poles with chemicals or place a metal skirt around their base.

Moves To Larger Quarters

The Newman Manufacturing Company, Incorporated, announces the removal of its General Offices and plant facilities from Bonner Springs, Kansas, to Kansas City, Missouri, in order to better serve its trade.

The Newman Company manufactures Line Clearance tools with distribution in every one of the forty-eight states, and Canada, and post war plans are being made to add a number of splendid items to its already complete line.

The officers of the Company are J. G. Gale, President and General Manager, and Wallace Agey, Secretary-Treasurer.

Japanese Girls As Operators Considered

The Lincoln Telephone and Telegraph company has been asked by the federal government to consider use of American-born Japanese girls as telephone operators in their Lincoln and other southeast Nebraska offices. The officers of the company are considering the idea seriously. It takes about 600 girls to operate lines of the company and the matter of keeping them open is increasingly difficult.

"The lines must be kept open," says R. S. Brewster, general traffic superintendent of the telephone company. "Long distance line operation is particularly essential to the operation of government plants. It is a matter vital to war. Many of our girls have gone into war industries, with which we are not able to compete in the matter of salaries."

Any Japanese girls applying for a position with the company will be o.k.'d by the FBI before being employed, Mr. Brewster says.

"We are going to keep our lines open," he adds. "If it means employing Japanese girls, that is what we will do."

The problem has been particularly acute in the western part of the telephone company's territory, where the Hastings, Harvard, Bruning and Fairmont war plants make business very heavy.

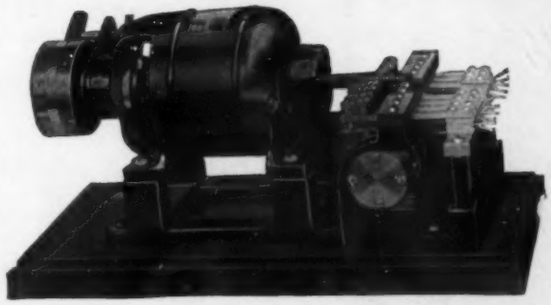
ALL the strength and durability inherent in steel are combined---with definite economies---in *Crapo* Galvanized Steel Strand. Heavy, ductile, tightly-bonded zinc coatings, applied by the famous *Crapo* Galvanizing Process, provide lasting protection against corrosion.

Ask the distributor of *Crapo* Galvanized Products near you or write direct for further information!

INDIANA STEEL & WIRE CO.
MUNCIE, INDIANA

Let HOLTZER-CABOT *Engineers* help solve your ringing problems

MOTOR-DRIVEN INTERRUPTER



★

Holtzer-Cabot complete motor driven interrupter equipment combines a method of producing good signaling tones with a means for automatic ringing.

★

features

1. Eliminates slow acting relays
2. Reduces maintenance
3. Gives positive timing
4. SIMPLE and DEPENDABLE

For complete information, Write

THE HOLTZER-CABOT ELECTRIC CO.
125 Amory St., Boston, Massachusetts 6161 So. State St., Chicago, Ill.

LENZ OPERATOR'S CORDS
LOOK FOR
LENZ
THIS MARK OF QUALITY
Longer service plus increased durability are proven features of LENZ Operators Cords. Sturdy tinsel conductors. Durable insulation with outer braid of extra strong thread. Finest moisture-proof construction. The choice of most operators. Write today for Handy Cord Chart listing all types.
LENZ Cords, Wires and Cables fit into the War Program perfectly due to their high quality and superior performance. Keep 'em talking with LENZ.
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1751 N. WESTERN AVE., CHICAGO, ILLINOIS, U. S. A.
"IN BUSINESS SINCE 1904"

Telephone Engineer

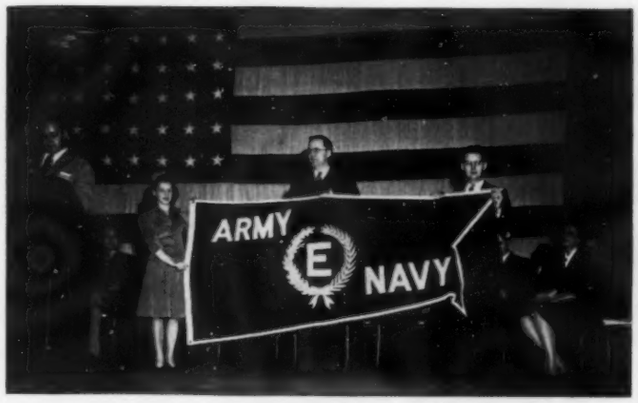
HANDBOOK TABLES

File—Open Wire Design
Date—December 15, 1943

Subject—Electrical and Mechanical Data on Galvanized Iron or Steel Line Wire

Galvanized iron or steel line wire is obtainable in three grades as follows: "BB" (Best Best) grade iron wire, "Extra BB" (Extra Best Best) grade iron wire, and "Steel" grade steel wire. "BB" wire is slightly higher in resistance than "Extra BB" wire but has better tensile strength. It has a maximum resistivity (unit resistance) of 5600 mile-pound ohms and a conductivity of 76% compared to that of pure iron wire. "Extra BB" wire is highest in electrical conductivity with a maximum resistivity of 5000 mile-pound ohms and a conductivity of 91% compared to that of pure iron wire. "Steel" wire is a grade designed for short-line service where conductivity is not so important as tensile strength. It has a maximum resistivity of 6500 mile-pound ohms and a conductivity of 65.3%

				— B.B. Grade —		— E.B.B. Grade —		— Steel Grade —	
Size B.W.G.	Diam. Inches	Wt. Per Mile Lbs.	Coil Length Miles	Max. Resistance Ohms per Mile	Breaking Strength Pounds	Max. Resistance Ohms per Mile	Breaking Strength Pounds	Max. Resistance Ohms per Mile	Breaking Strength Pounds
4	.238	811	¼	7.15	2271	5.98	2028	8.32	2433
6	.203	590	1/3	9.83	1652	8.22	1475	11.44	1770
8	.165	390	½	14.87	1092	12.43	975	17.31	1170
9	.148	314	½	18.47	879	15.44	785	21.50	942
10	.134	258	½	22.48	722	18.79	645	26.16	774
11	.120	206	½	28.18	577	23.54	515	32.77	618
12	.109	170	½	34.12	476	28.53	425	39.71	510
14	.083	99	½	58.59	277	48.98	247	68.18	297



Holding Army-Navy "E" award flag are Miss Rose Chamerski, Walter C. Hasselhorn, and Wayne Morrison.

Army-Navy "E" for Cook Electric

On November 17th in the Lane Technical High School Auditorium, in Chicago, the Cook Electric Company employees received the Army-Navy "E" production award for excellence in war production.

Mr. John Harrington, CBS Network commentator, as the master of ceremonies, introduced Lieutenant Colonel H. C. Miller, U. S. A. of the Chicago Signal Depot, who made the presentation of the award. The acceptance was made by Mr. Walter C. Hasselhorn, president of Cook Electric Company. Lieutenant H. L. J. Collins, U. S. N. of the Chicago Navy Inspector's Office, made the presentation of the "E" pins. Speakers for the employees were Miss Rose Chamerski, for Cook Electric women, and Mr. Wayne Morrison, for Cook Electric men. Ensign Betty Shelby of the WAVES and Lt. Elfrieda Heideman of the WAC made the individual presentations of the "E" pins to Cook employees.

On the following afternoon at the stirring flag raising ceremony, at the Cook plant, Major Allen V. Martini, of the Army Air Forces, commended the Cook employees for their excellent job in the war effort.

Cook Electric Company is a manufacturer of military communications equipment and aeronautical accessories. They are now manufacturing over 150 products for the Signal Corps, Army Air Forces, Navy and Merchant Marine.

Walter C. Hasselhorn, president, Cook Electric Company, making speech of acceptance of Army-Navy "E".

Stanley H. Manson Named

Coordinating the company's entire promotion and advertising program, a public relations department has been organized by the Stromberg-Carlson Company, as an important step in its post-war planning, it was announced today by Lloyd L. Spencer, vice-president and general sales manager of the company.

Stanley H. Manson, sales promotion manager and executive secretary of the company's labor-management committee, will head up the new department, which will not only plan and direct advertising and publicity, but will handle sales promotion, dealer and consumer relations, and direct the company's publications.

In making the announcement, Mr. Spencer said: "Stromberg-Carlson's post-war program in the largest sense, consists in the careful planning for the distribution of its products as widely and as efficiently as possible. Accomplishing this means using to the fullest advantage all the media of information—newspapers, magazines, radio,—a vital part

★ ★ ★ ★ ★ ★

NATIONAL DEFENSE

★ ★ ★ ★ ★ ★

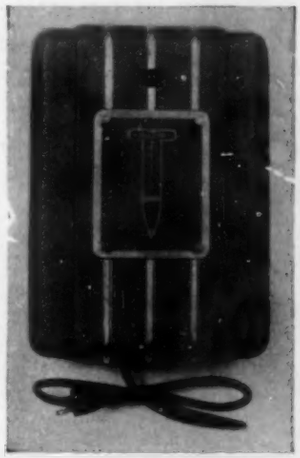
has

PRIORITY

While "all-out" National Defense cooperation is taxing our production facilities — We are proud we have been able to continue to make satisfactory deliveries to our government and to our customers in the telephone field.

TELERING

Reliable ringing service is essential in providing satisfactory telephone service.



Directly converts Commercial Alternating Current to Telephone Ringing Current—Current Consumption Negligible—Positively NO radio interference.

Use TELERING and provide the MOST reliable service at the LEAST cost.

Order through your jobber or direct from

TELKOR, Inc.
ELYRIA, OHIO

Test-O-Lite

TESTS ANY VOLTAGE...
100 to 550 Volts, A.C. or D.C.
—Safely, Swiftly, Surely

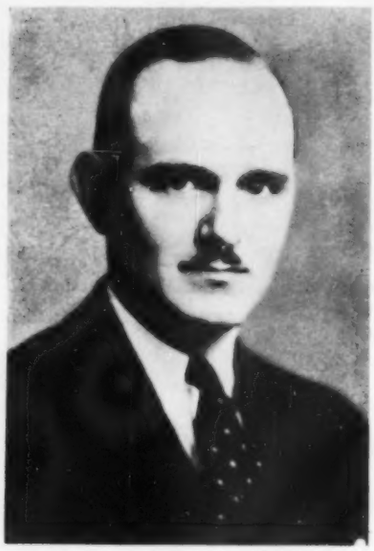
THE NEON GLOW
LOCATES TROUBLE INSTANTLY

in electric circuits, fuses, cut-outs, motors, radios, appliances, etc.

PUTS "FINGER" ON THE TROUBLE SPOT

Indicates hot or grounded wires. Tells AC from DC. Far superior to ordinary clumsy test bulb. Indispensable in shop or home. Has PATENTED safety features. Vest pocket size with clip. Life time guarantee. List $1.50. (Priority A-7 required.) Purchase thru electrical dealers.

L. S. BRACH Mfg. Corp.
55-63 Dickerson St. Newark, N. J.



Stanley H. Manson

of that planning by us and by all industry. This will be one of the most important functions of our new public relations department."

Mr. Manson is a member of the Rochester Chamber of Commerce, Electrical Association, YMCA, RMA Advertising Committee, Rochester Club, Sales Managers Club, Dartmouth Club and the Sigma Chi Fraternity and Salesman's Club, and Central New York Advertisers.

R. W. Hall, Former Indiana Wire Chief, in South Pacific

Mr. H. W. Hogue, district manager for the Kellogg Switchboard and Supply Company, recently received a communication from Ronald W. Hall, formerly the wire chief at Huntington, Indiana and now serving with the Signal Corps in the South Pacific.

Ron reports that he had been at Guadalcanal but for military reasons does not tell what sector he is in at present. His outfit has seen plenty of trouble, has had plenty of work and is almost continuously on the move. As Ron puts it, "we move pretty often—but not backwards."

The men of the Signal Corps are working under extreme conditions setting up new communication lines as the fighting progresses and repairing damaged lines under fire. The responsibility placed upon them at the battle fronts to keep the communication lines open involves vigilance and courage, in addition to the specialized training and technical knowledge of Signal Corps equipment and apparatus. The men praise highly the manufacturers of the equipment and materials they are using.

In usual military fashion, Ronald Hall's letter passed through the offices of the Army Censors. Upon it's receipt, Mr. Hogue recognized that the Examiner was also known to him as a former Indiana telephone man. For Lt. Robert E. Layman, now with the U. S. Army Signal Corps, was manager of the Warren Telephone Company at Warren, Indiana, prior to the war. This situation, like the war itself which Mr. Hogue's friends are helping to bring to a successful conclusion, is certainly the result of an unusual happenstance.

You can rely on Pole line Hardware that bears the L-M trademark

LM

✓designed the way you want it
✓built to last
✓packed for convenience
✓RIGHT in ALL WAYS

LINE MATERIAL COMPANY

Represented By AUTOMATIC ELECTRIC SALES CORPORATION

Ray-O-Vac Names Conlin

J. V. Conlin, advertising manager of the Ray-O-Vac Company, makers of dry batteries, has been named Public Relations represenative. His new work will embrace supervision of all relations between the company and the public, including advertising, news and public meetings.

Mr. Conlin, a graduate of the University of Wisconsin, has been in sales promotion work for 20 years. He was formerly associated with the Hole-

proof Hoisery Company, Milwaukee, later with Coopers, Inc., Kenosha. His first work with Ray-O-Vac was in chain store developments and 2 years ago he was appointed advertising manager.

Ray-O-Vac advertising has been extended considerably under Mr. Conlin's leadership, both in consumer and business magazines. At the present time Ray-O-Vac advertising is based on war-time adventures in which batteries have played a vital part.

Ralph A. Hackbusch

Rejoins Stromberg-Carlson

Ralph A. Hackbusch, vice-president in charge of radio and director of the radio division of Research Enterprises Ltd., founded in 1940 by the Canadian government to undertake research and the manufacture of radio optical glass and other war equipment, has rejoined the Stromberg-Carlson Company of Canada in a new capacity as vice-president and managing director, it was announced today by Lloyd L. Spencer, president.

Mr. Hackbusch, one of the outstanding radio engineers of North America, left Stromberg-Carlson in 1940 to join the Government effort, and in his capacity supervised thousands of employees and one of the largest engineering staffs of any Canadian radio industry. He played a large part in the tremendous task of organizing and bringing into production one of the most important units in the production of vital specialized electronic devices on the North American continent. While at Research Enterprises, he made several trips to European areas to observe equipment in action.

WANTED. A man to take care of Greenup telephone plant. 257 telephones. Reasonable work and reasonable wages. Greenup Telephone Co., Greenup, Illinois.

Gray Paystations—

1. Serve More People
2. Eliminate "Free" Calls
3. Provide Convenience
4. Increase Revenue

Introducing the
New 60 Series

The new Type 60 Series of Gray Paystations are equipped with the exclusive and unique balanced anti-sidetone circuit used in the very newest types of Automatic Electric telephones, assuring exceptional transmission quality. Available in handset or conventional style for automatic or manual exchanges and for postpay or prepay operation.

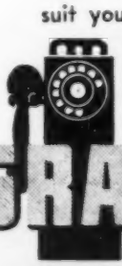
Right now there's added incentive in increasing your paystation lines. Aside from the added revenue, paystations fill a definite place in the needs of a nation at war.

They provide service for many people who, under present regulations, are unable to obtain private telephones. They furnish the ideal answer for telephone convenience in army camps, in war plant areas and in new housing developments. Installed in plants and offices, they give employees a handy means of making personal calls and at the same time keep the regular switchboard lines free for vital business traffic.

Why not check your paystation lines now, and look for the added possibilities in your locality?

WRITE FOR CATALOG 4078

A complete reference to all types of Gray Paystations as well as a guide book to the best kind of paystation to suit your particular needs. Write for it today—it's yours for the asking.



GRAY PAY STATIONS

DISTRIBUTED BY

AUTOMATIC ELECTRIC
SALES CORPORATION

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The Clearing House

For the convenience of readers of Telephone Engineer

Directories

Are MANPOWER Troubles Cutting Your Directory Adv. Sales?

★ We have the MANPOWER, the EXPERIENCED ORGANIZATION to take over your Telephone Directory Advertising, handle all details and produce MORE NET revenue (all costs considered).

Write or call at our expense.

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Citizens Trust Bldg., Fort Wayne, Ind.

135 So. Second Street, Philadelphia, Pa.

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Western Elec. No. 323 Transmitters complete less back @	$1.15
Western Elec. No. 2c Ball type drops and jacks 5 per strip @	8.25
Stromberg-Carlson No. 9a Talk Through repeating coils @	1.25
Dean or Kellogg 8A or 42A Repeating coils Talk through type @	.75
Western Elec. No. 154 Individual Jacks @	.3
Western Elec. No. 71 C. Retard Coils @	1.50
Kellogg No. 115 Grabaphone with 3 Cond. cord @	5.00
Kellogg No. 111 C. B. Grabaphone with 2 Cond. Cord @	5.00
Kellogg or Western Elec. Composition Rec. shells with caps New @	.45
Kellogg, Dean, W. E. Monarch, S. C. Leich or Monarch Mouthpieces New @	.08
Stromberg-Carlson No. 69A Protector rack with fuses and carbons 20 lines per strip @	3.00
Stromberg No. 55 3 Cond. Swbd. Plugs practically New @	.65
Stromberg 2 Cond. Swbd. Plugs for No. 11 drop @	.40
Switchboard cord weights @	.20
Western Elec. No. 186 A Relays @	1.00

REBUILT ELECTRIC EQUIPMENT CO.

1704 West 21st Place

Chicago 8, Ill.

Classified Ads

COMMUNICATION WIRE CHIEF WANTED: The Tennessee Valley Authority has open a position for Communication Wire Chief at an annual entrance salary of $2,300 based on a 40-hour week. This position now scheduled for a 48-hour week and carries a salary of $2,798 per annum. An increase to the standard rate of $3,163 (48-hour workweek) is given after a minimum of one year of satisfactory service.

The duties will involve testing, coordination of trouble, and maintenance of records on wire lines, wire terminals, wire carrier, and power line carrier communication equipment. Applicants should have high school education and several years' experience in testing and locating trouble on communication circuits by D.C. and A.C. electrical measurements.

Candidates interested in this or other communication positions should write requesting an application form. Persons now employed on other war work should not apply. Address all communications to the Personnel Department, Tennessee Valley Authority, Knoxville, Tennessee.

WANTED—Man to repair and rewire Magneto Telephones. For Factory in Chicago. Write Box 8306, c/o TELEPHONE ENGINEER.

WANTED—Telephone Company with multi-exchange and toll system operation serving 10,000 stations in Kentucky needs a District Plant Superintendent. State salary expected, qualifications and draft status first writing. Write Box 8308, TELEPHONE ENGINEER.

WANTED — Cable splicer to work in Illinois. Permanent job. Furnish resume of experience and qualifications in first letter. Statement of availability required. Reply Box 8313, c/o TELEPHONE ENGINEER.

WANTED: Telephone Accountant—qualified to supervise all phases of telephone accounting for Class A companies. Give full information as to age, experience, draft status, etc. Attach small photograph. Telephone Services Inc., 16th Floor Lincoln Tower, Fort Wayne, Indiana.

Telephone Engineers

JAY G. MITCHELL

Consulting Engineer
Operating and Management Economics
Plant—Equipment—Revenue
P. O. Box 602
SPRINGFIELD, ILLINOIS

J. W. WOPAT

CONSULTING ENGINEER

Telephone Engineering — Construction Supervision — Appraisals — Financial — Rate Investigations

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J. G. WRAY & CO.

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Specialists in Appraisals, Rate Surveys, Financial Investigations, Organization and Operation of Telephone Companies
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Finished Cedar Poles
VALENTINE CLARK CORPORATION
St. Paul, Minn.

REVITALIZE
YOUR SWITCHBOARD
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RECONDITIONED PARTS

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BUCKEYE TELEPHONE & SUPPLY COMPANY
COLUMBUS, OHIO

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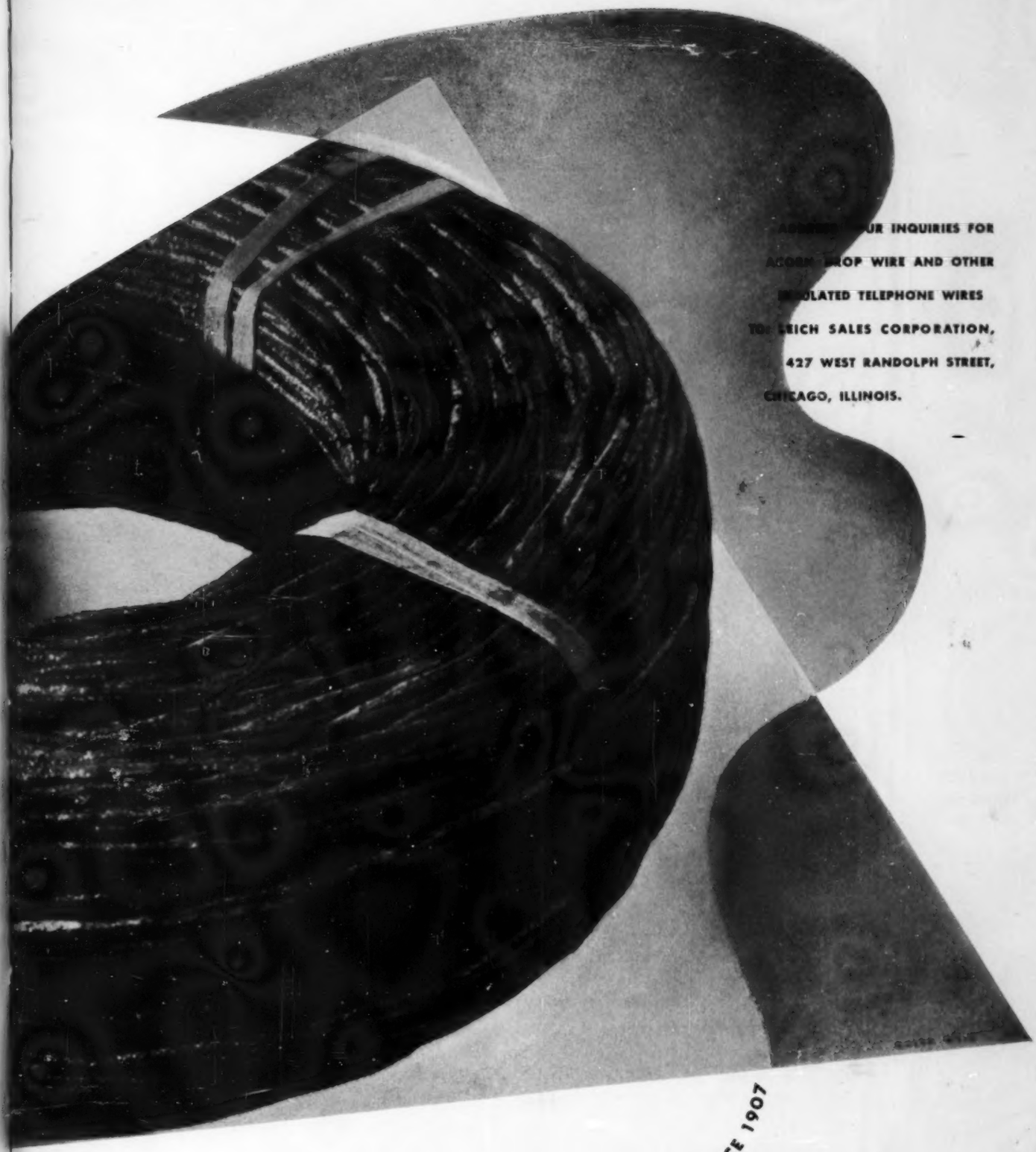

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MANUFACTURERS OF TELEPHONES, SWITCHBOARDS AND RELATED APPARATUS SINCE 1907

AS *Night Ends*

• No finer Christmas Gift could be presented to the freedom-loving people of the earth than the long-awaited Victory package . . . a parcel containing the day we now dare to hope will go down in history soon as a new Armistice Day . . . the Day of Unconditional Surrender of the forces of evil.

The earnest endeavor and solemn determination which carried us through 1943 will hasten the victory. Then, we hope, all men may again walk together as brothers, to deal with each other in good faith, and to enjoy the fruits of labor in security.

This is the 2000 year-old message of Christmas Day. Through dark times, as well as happier ones, this message has been written across the morning sky at the beginning of every new day, week and year—for those who would see and read it.

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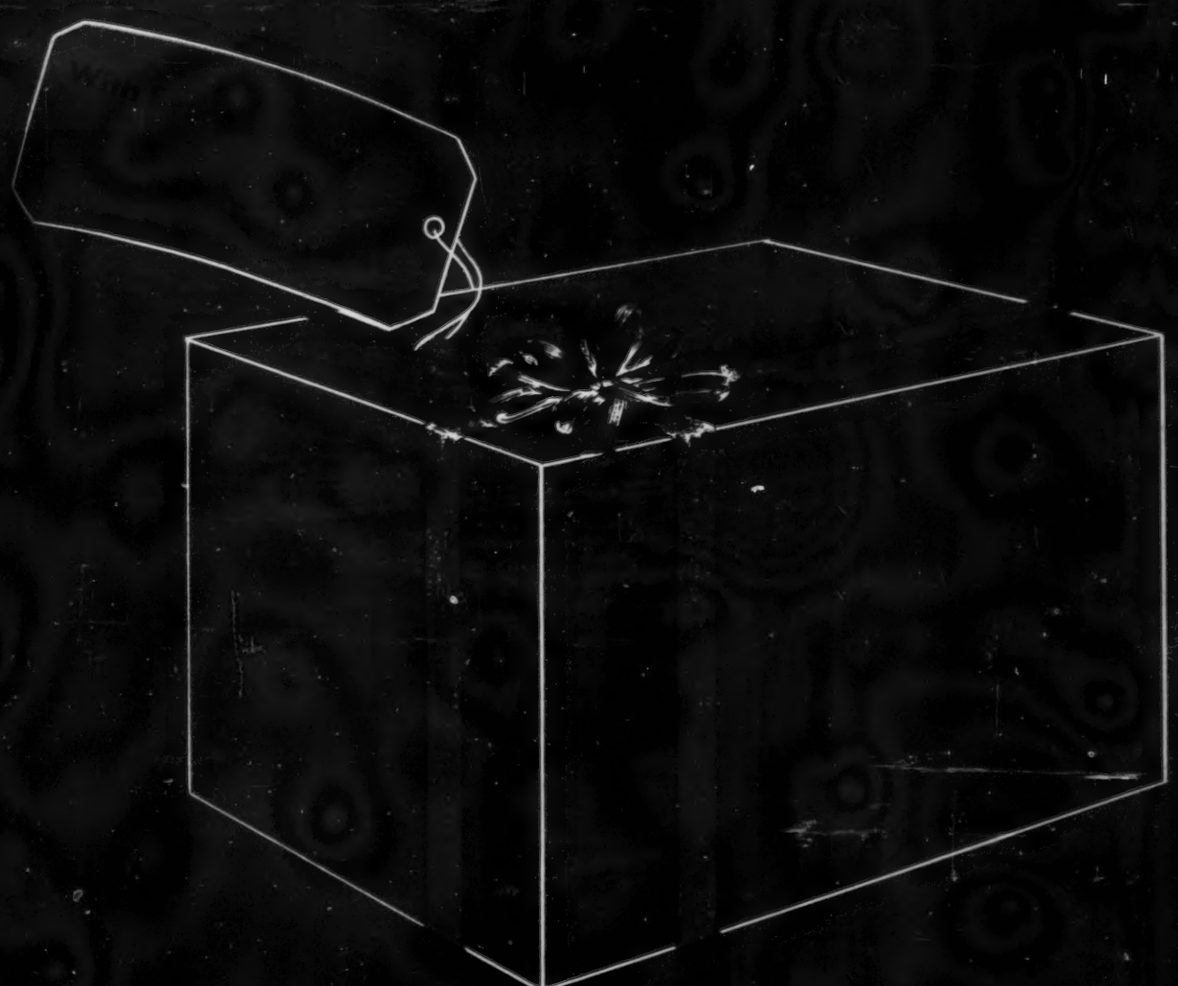

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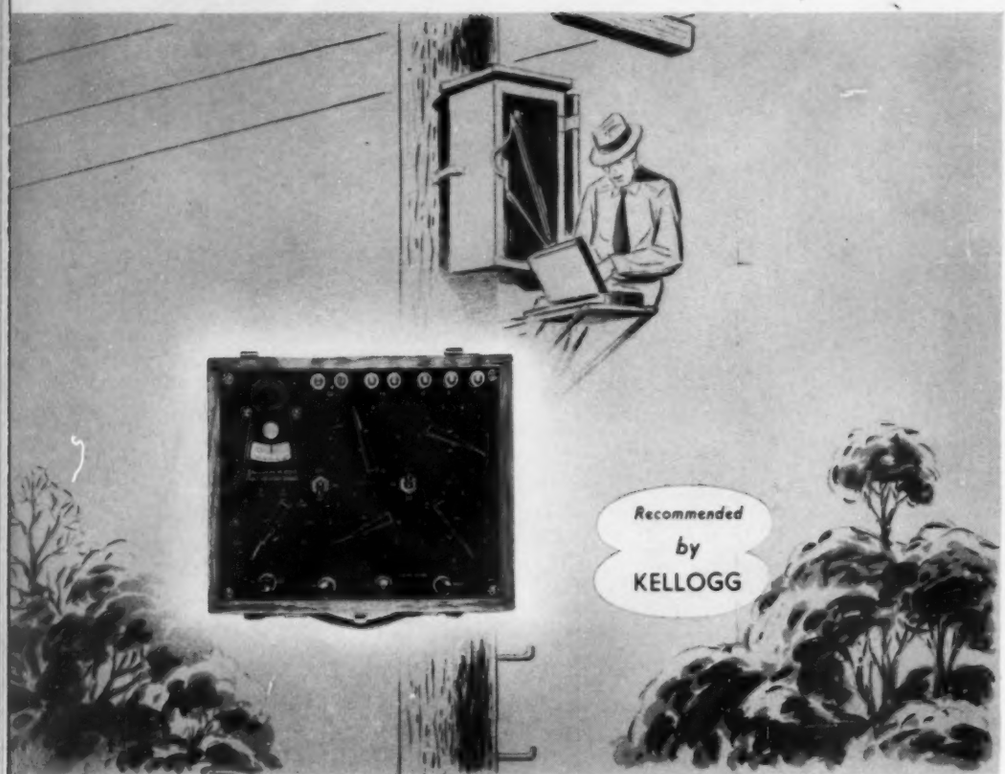
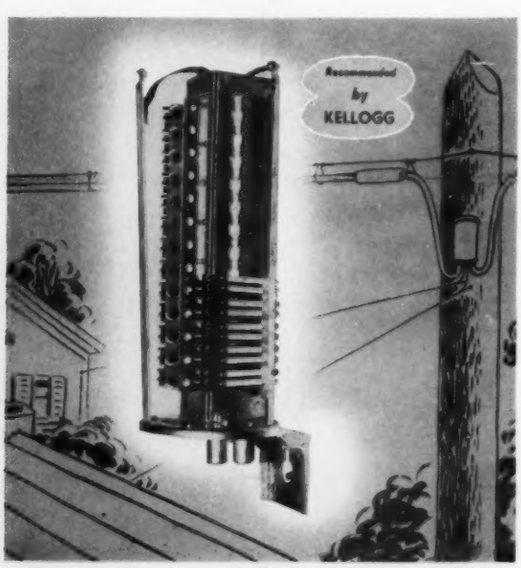


Shallcross Manufacturing Co. Telephone repair departments find the Shallcross Fault Location Bridge a "must" item of testing equipment. It permits measurement of cable resistance . . . locates grounds, crosses, opens and shorts and inductive crosses or split pairs with a high degree of accuracy.

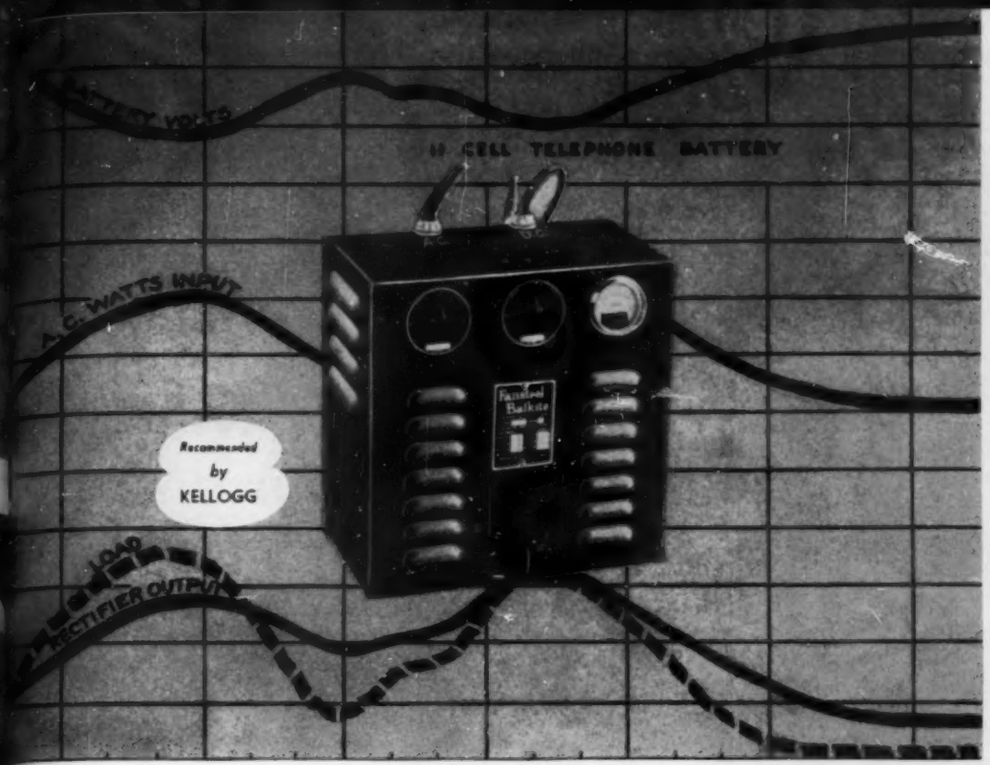
W. A. Hammond Drierite Co. To dry splices in lead-covered cables, just sprinkle granular *Drierite* Dessicant among the conductors.

Armstrong Cork Company "Whitall Tatum" Insulators are a poor target for vandals because of their crystal clarity—but a "best buy" for telephone men because of their high quality and resistance to temperature changes.



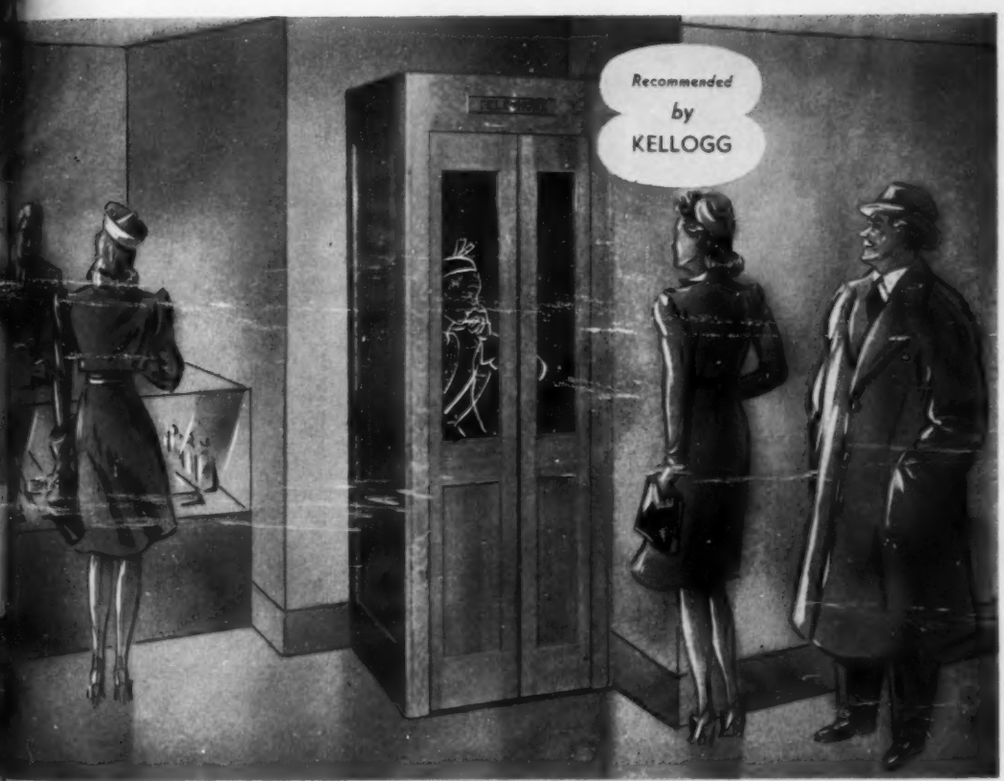
Cook Electric Company Trouble shooting and transmission testing are greatly simplified when long cable runs are sectionalized with Cook UA-20 Cable Terminals. To open cable pairs, just remove fuses and test in either direction.

Paragon Electric Co. Ironite Drop Wire can "take it"—in the snow and sleet of the north as well as the heat and humidity of the south. What's more, it saves critical copper, now needed urgently in war production.



Fansteel Metallurgical Corp. There is no over or under charging when Fansteel Taper Rectifiers are used. The charge rises with increased traffic and tapers off during light load periods. This rectifier is ideal for PBX, toll and small central office batteries.

Kester Solder Co. With war messages crowding the wires, it is doubly important to use Kester Rosin-Core Solder to protect joints and improve transmission. That's one reason why it's used extensively in the Kellogg Factory.



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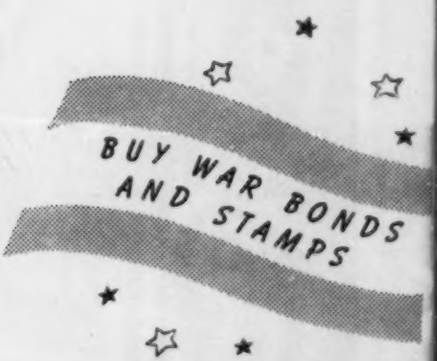

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The first line... to the front line

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The lightning-like advances of modern, mechanized troops require rapid construction and re-construction of communications systems between the front line and G.H.Q. Right behind the advancing front line, and often, well in advance, are the men of the Army Signal Corps. Highly trained experts in their every duties... they do their job swiftly and efficiently, often under heavy fire. Exide salutes the brave and progressive men of the U. S. Army Signal Corps. And Exide Telephone Batteries stand by to help carry unlimited messages to the front.

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ARMY E NAVY

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TELEPHONE
BATTERIES

A Christmas request in the Christmas spiri

The advertisement on the opposite page appears in December magazines—and in January magazines issued before Christmas.

In graphic, good-humored fashion, it asks every one's help to hold down the Christmas rush of Long Distance calls.

This friendly request ought to bring a friendly response—promoting a better understanding of the seasonal problems facing all telephone companies.

AN ADVERTISEMENT OF THE BELL TELEPHONE SYSTEM

There's a Christmas rush on telephone wires, too

Help keep war-crowded circuits clear on December 24, 25 and 26.

Please use Long Distance only if it is vital.

War needs the wires—even on holidays.

BELL TELEPHONE SYSTEM

The Attack Your Extra Bonds Must Back

Every penny counts — At FEDERAL, where communications equipment is made for our armed forces, an idea is spreading. For every axis plane reported shot down, employees drop an extra *coin in a box — for* extra *bonds for* extra *bombs and bombers.*

Thundering out of the overcast
Like a midnight express
The first wave of bombers
Spots the twinkling steel mill . . .
Blasts it into a roaring volcano
As the hinges of hell open
And fill the sky with daggers of light
And streaking, shrieking meteors of ack ack

Silhouetted against this inferno
Another target looms
And the young voice of the squadron leader
Speaking over the interplane radiotelephone
Calmly directs the *next* wave of bombers
To the doomed power plant ahead . . .

• • •

Shuddering under the impact
Of flak and fighter fire
The rocketing war birds
Level off into their "run"
And the pale bombardier catches his breath
Like he used to when he called signals
In the games back at "State"
As he whispers . . . *'Bombs . . . away!'*

Did he say *"bombs" . . . or "bonds"?*

• • •

Down they hurtle
The bonds
That have been converted into TNT . . .
Your milkman's bond
Your stenographer's bond
The bond of the woman who cleans your office
Of the neighbor whose boy was in today's battle
And YOUR bond . . .
Your EXTRA bond . . .
Is THAT there, too?

• • •

Here at I. T. & T.
And its associate companies
Communications equipment and services
Are only part of the job . . .
Every man and woman here
Is buying war bonds
Extra war bonds
To back the attack
And bring our sons and brothers
Home

I T&T

International Telephone and Telegraph Corporation *67 Broad St., New York 4, N. Y.*
Manufacturing Associate:
Federal Telephone and Radio Corporation

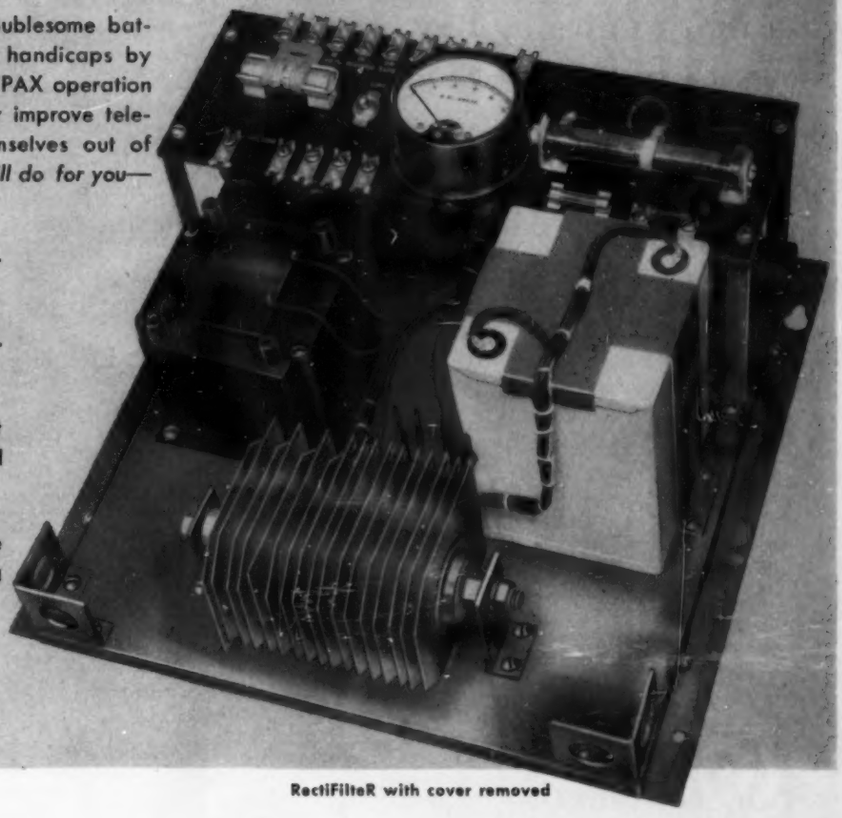
RAYTHEON RECTIFILTERS

(Battery Eliminators)

Eliminate Battery Headaches in PBX and PAX Service

Raytheon RectFilteRs overcome troublesome battery maintenance and inspection handicaps by supplying DC power for PBX and PAX operation directly from the AC source. They improve telephone service and pay for themselves out of savings. *Here's what RectiFilteRs will do for you—*

- Eliminate batteries and the expense of routine service.
- Release charging pairs, for revenue producing service.
- Provide stabilized DC output voltage from no load to full load regardless of AC variations.
- Minimize power costs because of high efficiency in converting AC to DC.
- Save $30 to $90 a year.



RectiFilteR with cover removed

The coveted Army-Navy "E", for Excellence in the manufacture of war equipment, flies over all four Raytheon plants where 12,000 men and women are producing for VICTORY.

Raytheon RectiFilteRs are efficient, dependable and economical. They have *no moving parts . . . nothing that requires maintenance.* Simply plug the RectiFilteR in, close the door and from then on it will take care of itself.

RAYTHEON MANUFACTURING *Company*
190 WILLOW ST. WALTHAM, MASS.

A GIANT THAT BENDS STEEL

In practically every department of the Stromberg-Carlson factories one will find in use amazing new machinery and methods to speed war production.

Of particular interest is the new *Sturdy Bender* press. It is a giant that bends steel. With this machine, the time required to bend switchboard sections is lowered a great many times and the quality of the work improved. All types of bends are possible — in fact, several different bends can be accomplished at the same operation.

After Victory, this new equipment will be available for Stromberg-Carlson's peace-time products. Faster and better production methods will result in telephone equipment that will make still truer the slogan, "There is Nothing Finer than a Stromberg-Carlson".

ARMY E NAVY

STROMBERG CARLSON

PROGRESS IN TELEPHONY

Stromberg-Carlson Company, Factory, General Offices: Rochester 3, N. Y.;
Branch Offices: Chicago, Kansas City, San Francisco, Toronto

IF WE CAN'T GO ACROSS
WE CAN "COME ACROSS"
Unfortunately, all of us can't go overseas and fight. However, we can make our *dollars fight* by putting them into War Bonds on a regular purchase plan.

WE AT YORK-HOOVER PLEDGE ANEW OUR FAITH IN THE IDEALS EMBODIED IN THE

Spirit of Christmas

AS WE RESOLVE TO WORK UNCEASINGLY TO THE END THAT PEACE AND GOOD-WILL TOWARD MEN MAY REIGN ALL OVER THE WORLD

FOR EXCELLENCE IN ARMY E NAVY BODY PRODUCTION

YORK-HOOVER BODY CORPORATION

BODY DIVISION . . . EAST YORK, PENNSYLVANIA

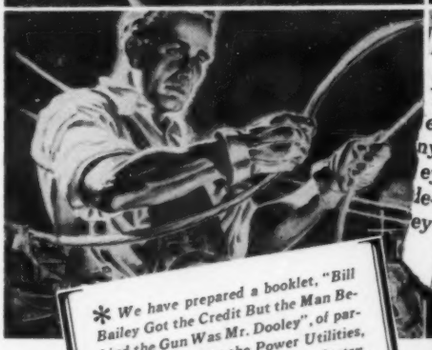
Another Tribute to "Mr. Dooley"*

CIVILIAN AWARDS

Testimony to the effect that the stimulus of the Army-Navy "E" and the Maritime "M" production awards has been very great constantly is accumulating. Both management and labor on the home front have been helped to even greater efforts and results by these recognitions of unselfish devotion to the great task of turning out the vital materials of war. Now both directors and workers in a category other than those previously recognized are to receive an achievement award for work well done. These are the seasonal processors of food. The fact that they are not year-round operators makes them ineligible for Army-Navy "E" recognition. But if they meet the same high standards demanded for that badge of honor they are to receive the award of the War Food Administration's "A" flag. Qualifications considered in selection for the award will include ingenuity in the development of war food products, low absenteeism, cooperation in the various food purchase programs, accident prevention and the like.

A number of vital factors on the home front still lack recognition in the form of public awards. The power and utility companies, the communications companies, and even the enormously busy railroads do not fall within the technical requirements for existing awards. There would seem to be little reason why the powerful incentive which existing awards for merit have supplied should not be extended to such fundamentally important elements as the electric light and power industry, which has shown an increase of 73 per cent in its kilowatt hour output since 1939; or the telephone industry, which last year handled 93 per cent more long-distance calls than in 1939; or the American railroads, which in 1942 increased the ton miles moved as compared with 1939 by 92 per cent and the passenger miles by 135 per cent in the same period. The service industries have done and are doing an outstanding war job. They, too, deserve an accolade.

From the Editorial page of **The New York Times** *October 23, 1943*



* We have prepared a booklet, "Bill Bailey Got the Credit But the Man Behind the Gun Was Mr. Dooley", of particular interest to the Power Utilities, the Railroads, the Telephone Industry, and the Electrical Wholesalers. A copy will be sent in reply to any request on a company letterhead. Address: General Cable Corporation, 420 Lexington Avenue, New York 17, N. Y.

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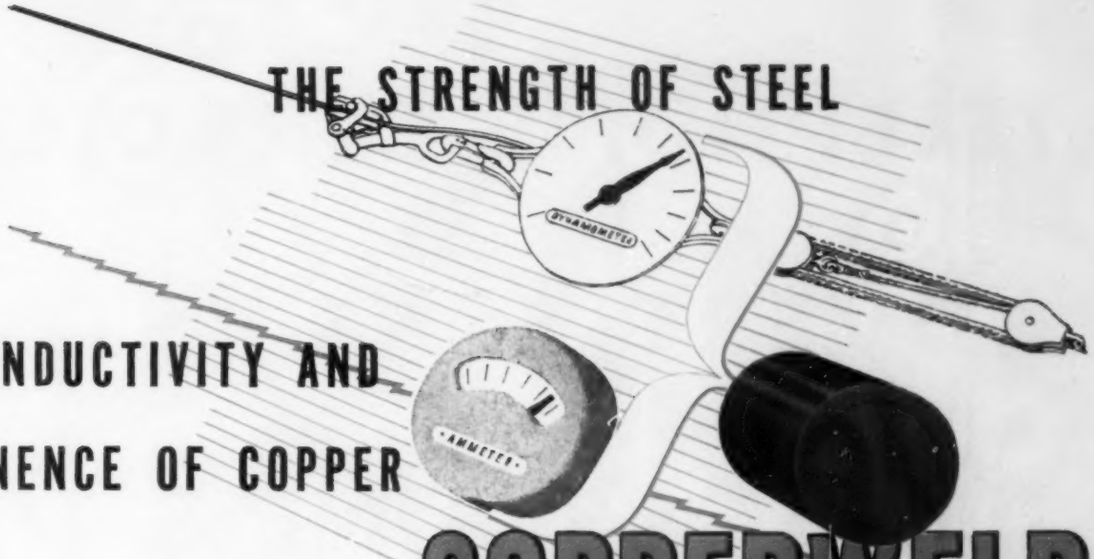
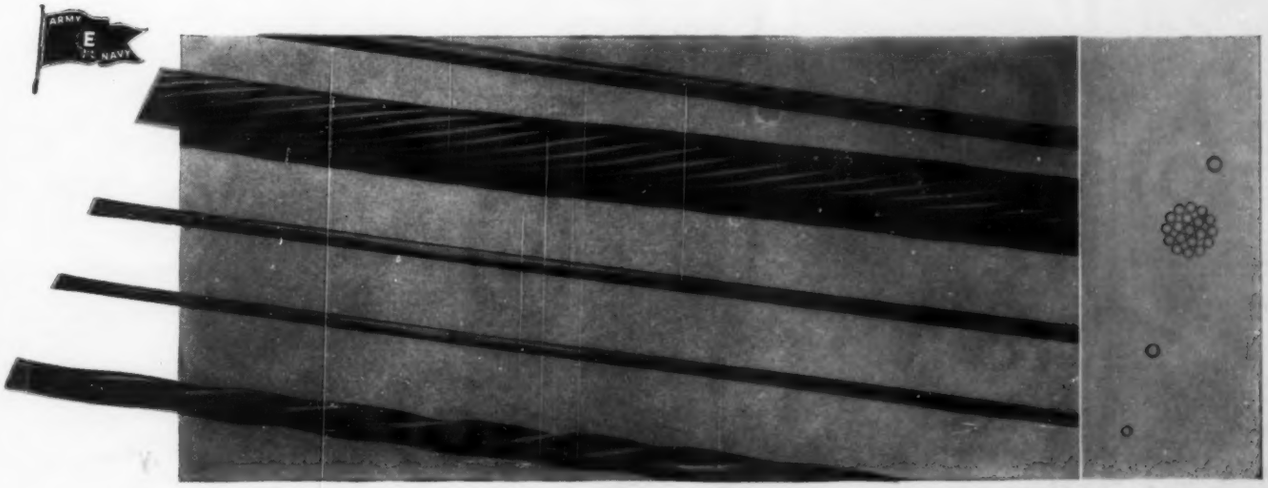
THE STRENGTH OF STEEL

THE CONDUCTIVITY AND PERMANENCE OF COPPER



COPPERWELD

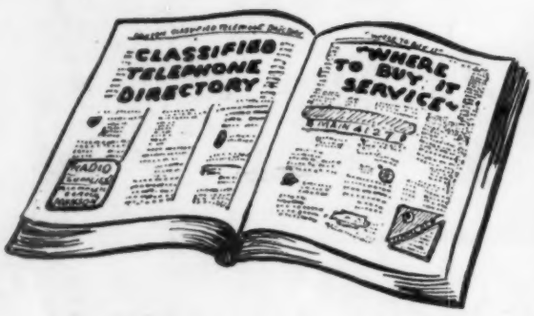
Copperweld wire derives its strength from its core of strong steel—steel permanently protected against rusting by a thick exterior of copper. The copper need only do the job that copper does best—provide *rust resistance and electrical conductivity*. The steel need only do the job that steel does best—*provide strength*. No other wire combines the strength of steel with the conductivity and permanence of copper.



Copperweld Steel Company GLASSPORT, PA.

TELEPHONE DIRECTORY ADVERTISING *SAVES TIME, GASOLINE & TIRES IN TELLING EVERYONE WHERE TO BUY ANYTHING ANYTIME—ANYWHERE

L. M. BERRY & CO.



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